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THE PROPOSED DUAL ORGANIZATION OF MANKIND.

By Prof. WILLIAM G. SUMNER.

RODBERTUS turned aside from his studies of taxation in the Roman Empire, which had shown him the Roman city exhausting and consuming the rest of the Roman world, to express the opinion that the history of the last three hundred years is a story of the exploitation of the outlying continents by the old centers of civilization. This was an attempt to describe summarily the significance for the human race of the opening up of new regions by exploration and colonization. The period during which the influences of the new extension of civilized settlements has been at work is so short that it is impossible to define with confidence its ultimate effects on the relation of the parts of the race to each other, and on the fortunes of the race as a whole. Recent events, however, have forced this subject upon our attention, for the "Monroe doctrine," as it has been recently affirmed and construed, would be nothing less than a doctrine and policy which some people are disposed to force upon the new organization of the inhabitants of the globe produced by the discovery and settlement of the outlying continents. If anybody claims to be able now to take control of this most portentous evolution in the life of the human race, and to dictate the course which it is to take, it behooves us all to verify the doctrine and to test the programme of policy proposed.

The era of geographical discovery and adventure passes for an era of glorious achievement by men, yet to what end did they care to know and reach the outlying parts of the earth? One motive which led them was the gain of commerce. The products of the Indies could be obtained in no other way, and the trade for

them was as old as civilization. The other great motive was to obtain new supplies of gold and silver, under an exaggerated and fallacious notion of the desirableness of those forms of wealth. Starting from these motives the movement has run its own course of commerce, colonization, war, missionary enterprise, economic expansion, and social evolution, for three centuries. The discovery, colonization, and exploitation of the outlying continents have been the most important elements in modern history. We Americans live in one of the great commonwealths which have been created by it. We are hard at work occupying and subduing one of these outlying continents, from a local and later but comparatively old center of civilization. In our own history we have been, first, one of the outlying communities which were being exploited, and then ourselves an old civilization exploiting outlying regions.

The process of extension from Europe has gone on with the majesty and necessity of a process of Nature. Nothing in human history can compare with it as an unfolding of the drama of human life on earth under the aspects of growth, reaction, destruction, new development, and higher integration. The record shows that the judgments of statesmen and philosophers about this process from its beginning have been a series of errors, and that the policies by which they have sought to control and direct it have only crippled it and interrupted it by war, revolt, and dissension. At the present time the process is going on under a wrangle of discordant ethical judgments about its nature and the rights of the parties in it. We are rebuked for the wrongs of the aborigines, the vices of civilization, the greed of traders, the mistakes of missionaries, land-grabbing, etc., yet we Americans and others are living to-day in the enjoyment of the fruits of these wrongs perpetrated a few years ago. The fact is, as the history clearly shows, that the extension of the higher civilization over the globe is a natural process in which we are all swept along in spite of our ethical judgments. Those men, civilized or uncivilized, who can not or will not come into the process will be crushed under it. It is as impossible that the present and future exploitation of Africa should not go on as it is that the present inhabitants of Manhattan Island should return to Europe and let the red man come back to his rights again. The scope for reason and conscience in the matter lies in taking warning from the statesmen and philosophers who have been overhasty in the past with their doctrines and policies of how the process must go on.

Looking at the movement of men from Europe to the outlying continents as a phenomenon in the development of private interests and welfare, it appears at once that the man who went out as a fortune-hunter and he who went out as a colonist are on a very

different footing. The former might be said to aim at selfishly exploiting the outlying country because he hoped, after a few years, to return to Europe and there enjoy his gains. The same could not be said of the colonist, for he cast in his lot with the new country, hoping there to establish a new home for his descendants and to build up a new commonwealth.

If the same movement is regarded from the standpoint of the duties and interests of European states, it is evident that both the fortune-hunter and the colonist needed, at first, the support and protection of the state from which they went forth. The whole movement of discovery and settlement appears, in this point of view, as a manifestation of growing social power in western Europe, and the nations there are seen to have made, in the first instance, a great expenditure of energy and capital for which they never received any return. The relation was one of parenthood, and therefore one of sacrifice on the part of the mother countries. This relation was, however, obscured by traditions and accepted notions of national aggrandizement and glory, and by notions about commerce which were accepted as axiomatic. These notions drove the great states into policies of conquest, exclusion, monopoly, and war with each other. As a consequence, the whole grand movement came to be regarded by European statesmen from the standpoint of gain to European nations, and they adopted sordid measures for snatching this gain from each other. Those statesmen assumed that Europe was the head of the world, and they allotted the outlying regions among themselves with no regard for the aborigines, and very little regard for the colonists. The body of relations which was established between the Old World and the New, under this theory, constituted the colonial system.

It can not be denied that the colonial system stands in history as an attempt to exploit the outlying continents for the benefit of Europe. Thousands of lives and millions of capital were expended in the effort to perfect the system, and in that struggle to steal each other's colonies which the system caused. The logical outcome was the ambition of each competitor to win universal dominion for itself, and to impose a balance-of-power policy on each of the others. The system had its doctrines too; some old, some new: "He who holds the sea will hold the land"—"Trade follows the flag." The English colonial system was far less oppressive and more enlightened than that of any other nation. It alone was founded on real colonization and aimed to create new commonwealths. It was therefore the one under which the system first broke down, for it contained a fatal inconsistency in itself. It educated the colonists to independence, and it was certain that they would go alone as soon as they were strong enough to do so,

if they thought that they were being exploited in the colonial relation. To such extent as this destiny was aimed at or unconsciously brought about, the construction of modern history put forward by Rodbertus fails to be correct.

It has become a common place of history that the revolt of the American colonies was a good thing for the colonies and for England. The question no longer has any other than speculative interest, and perhaps no speculation is more idle than that which deals with the possible consequences of some other course of history than that which actually took place; but, if such speculation ever could be profitable, it would be upon this question: What would have been the consequences to human welfare if the English statesmen of 1775 could have risen to the nineteenth-century doctrine of colonies, and if the whole English-speaking world could have remained united in sympathy and harmony? This question has so much practical value that it may help us to see the advantage there may be in a colonial relation where it still exists, and to see that there is no universal and dogmatic ground for independence which can be urged by a third party.

Independence was brought about on the Western continent; not to any important extent anywhere else. The Spanish-American colonies had grievances against their mother country which fully justified their revolt; still, it appears that they revolted chiefly from contagion and imitation. They have never been able to obtain good standing in the family of nations as independent commonwealths. The Panama Congress of 1824, in its original plan, promised to be a very important incident in the development of the relations of the New World to the Old. It appeared for a time that the Western continent might be organized as a unit in independence of, and possible hostility to, the Eastern continent. The project came to nothing. It was crushed in one of the hardest political collisions in our history, that between the Adams administration and the Jackson opposition. The theory of it, however, remains behind and, under the name of the Monroe doctrine, has remained as a vague and elastic notion. The practical outcome of any attempt to realize that doctrine must be to organize the world into a dual system. Instead of the old notion of a world-unit ruled from Europe as its head, we should have a dual world-system, one half under the hegemony of Europe, the other half under that of the United States. Is this a rational or practicable plan of future development? Is it not fantastic and arbitrary? If the United States pretends to hold aloof from a share in the affairs of the Eastern continent, and to demand that all European states shall abstain from any share in the affairs of the Western continent, is that anything more than a pose and an affectation? Have we not within a year or two been forced to

take action in protection of our citizens in China and Armenia? If Africa is opened up to commerce, do we mean to hold aloof from a share in it? Are we not already deeply interested in it so far as it has advanced? We have interests in Madagascar which have already drawn us into the proceedings there, and which promise to involve us still further. We accepted a rôle in the war between China and Japan which was by no means that of an uninterested stranger. Will any one maintain that we could carry out the policy of abstention in respect to that part of the world?

On the other hand, so long as European nations own colonies in America, how can we rule the Western continent without coming in collision with them? Even if we should dispossess them of those colonies, how would it be possible to rule the Western continent, and to deny them any right to meddle in its affairs, so long as their citizens may visit the same for business or pleasure? The notion that the world can be so divided that we can rule one part and Europe the other, and thus never be brought in collision with each other, is evidently a silly whim. We may talk about "Western civilization" or "American ideas," but these are only grandiloquent phrases. Everybody knows that there is no civilization common to all America and different from that of Europe; there are no ideas common to all America and different from European ideas. There has never been any sympathy between North and South America, and there are only few and comparatively feeble bonds of interest based on commerce or investments. Either North or South America has far stronger bonds to Europe than they both have to each other. As far as the external resemblance of "republics" is concerned, the South American states have hitherto only made republican government ridiculous. The geographical neighborhood, on which stress is often laid, can be seen by a glance at the map to be nonexistent. If it existed it would be of little importance compared with economic distance, which is reckoned by cost, time, and facility of transportation. The Western continents are divided from each other by race, religion, language, real political institutions, manners and customs, and, above all, by tastes and habits. They entertain a strong dislike of each other. The United States could never establish a hegemony over the Western world until after long years of conquest. In their quarrels with European states, it suits the South American states very well that the United States should act the cat's paw for them, but it can not be that their statesmen will be so short-sighted as to accept a protection which would turn into domination without a moment's warning; neither can it be possible that our statesmen will ever seriously commit us to a responsibility for the proceedings of South American states.

We may probe the ideas and projects which are grouped under this attempt at a dual organization of the world as we will, in no direction do we come upon anything but crude notions and inflated rhetoric. Such notions have hitherto proved very costly to the human race. President Cleveland, in his Venezuela message, sought a parallel for the Monroe doctrine in the balance-of-power doctrine. The parallel was unfortunate, if it had been true. The balance-of-power doctrine cost frightful expenditures of life and capital, and what was won by them? Where is the balance of power as it was understood in the eighteenth century, or in Napoleon's time? A real parallel to the Monroe doctrine is furnished by the colonial system. The latter, as above shown, was the doctrine of the unity of the world under the headship of Europe. The former is the doctrine of the dualism of the world, with Europe at the head of one part and the United States at the head of the other. One of these conceptions of the new organization of the human race, which is to grow out of the colonization and settlement of the outlying countries, is as arbitrary as the other, and the new one can never be realized without far greater expenditure of life and property than the other. If history and science have any power over the convictions and actions of men, here is a good opportunity for proof of it, for if anything is proved by ecclesiastical and civil history it would seem to be the frightful cost of phrases and doctrines, and of the whole cohort of phantasms which take the place of facts and relations in determining the actions of men. It is to these that men have always brought the heaviest sacrifices of their happiness, blood, and property. We have had in our own history the doctrines of no entangling alliances, State rights, nullification, manifest destiny, the self-expanding power of the Constitution, the higher law, secession, and as many more as rhetorical politicians have found necessary to save them the trouble of coming down to facts and law. How frightful has been the penalty for the people who have been deluded by some of these! Who knows on what day another of them may, by a turn of events, become politically important and call for its share of sacrifice? It is a wise rule of life for a man of education and sense not to allow his judgment to be taken captive by stereotyped catch-words, mottoes, and doctrines.

We have already a commercial system in which we have undertaken to surround ourselves by a wall of taxes so as to raise the prices of all manufactured products twenty-five to fifty per cent above the same prices in western Europe. That system has been adopted as a policy of prosperity to be produced by specific devices of legislation. We have applied it to the best part of the continent of North America. It is now proposed to restrict immigration so as to close the labor market of the same part of

North America, in the belief that wages will thus be raised, and that, if they are, a great advantage will be produced for the wages class. We have also a project before us to inclose all America in a barrier within which an arbitrary circulation of silver money may be secured, all relations with the money of the rest of the world being cut off. That these doctrines and projects all hang together, and are all coherent with the political notion of the dual division of the world, is obvious. The common element is in the narrow and distorted view of what is true and possible and desirable in social and economic affairs.

We have had before us, since the revolt of the English North American colonies, another conception of the organization of human society which is to come out of the extension of civilization to the outlying continents. It is, in fact, now imbedded in international law and in the diplomacy of civilized states. That is why the advocates of the Monroe doctrine have been forced to meet the argument that their doctrine was not in international law by new spinnings of political metaphysics. They have to try to cover the fact that the Monroe doctrine is an attempt by the United States to define the rights of other nations. The modern conception, however, is that the states of the world are all united in a family of nations whose rights and duties toward each other are embodied in a code of international law. All states may be admitted into this family of nations whenever they accept this code, whether they have previously been considered "civilized" or not. The code itself is a product of the reasoning and moral convictions of civilized states, and it grows by precedents and usages, as cases arise for the application of the general principles which have been accepted as sound, because they conduce to peace, harmony, and smooth progress of affairs. The code has undergone its best developments in connection with the spread of enlightenment and the extension of industrialism. This is the only conception of the relation of parts of the human race to each other which is consistent with civilization, and which is worthy of the enlightenment of our age. Any "doctrine" which is not consistent with it will sooner or later be set aside through the suffering of those who adhere to it.

THE citizens of Philadelphia have been reminded by Mr. B. E. Fernow, of the Bureau of Forestry, that that city possesses a forestry reserve of thirteen thousand acres in Centre County, Pa. It was given to the city by Dr. Elias Boudinot, President of the First Continental Congress, as a trust fund for the supply of fuel to poor persons at cost prices. It has been neglected, and much of the timber has been stolen or destroyed; but the work of reforestation was begun in 1888, and has been continued as means have permitted.

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SCIENCE AT THE UNIVERSITY OF PENNSYLVANIA.

By LEWIS R. HARLEY, Ph. D.

IN resigning the provostship of the University of Pennsylvania in 1894, Dr. William Pepper defined the broad policy of the institution in the following appropriate language: "The university is truly the voluntary association of all persons and of all agencies who wish to unite in work for the elevation of society by the pursuit and diffusion of truth."

The function of a university is not simply instruction but also research. In this latter field of work American universities are showing great activity, and remarkable results have been produced. The University of Pennsylvania has been particularly susceptible to the changing conditions of American life, as is illustrated in the modifications in its curriculum from time to time. When the institution was chartered as a college in 1755, no other school in this country offered so liberal a course of study. In 1810 the curriculum was modified and rearranged so as to conform to the new conditions which had arisen with the opening of the century; but old methods and old ideas prevailed until 1868, when Dr. Charles J. Stillé was elected provost. The elective system of studies was introduced, and every department of the institution felt the pulses of new life. During the fourteen years of Dr. Stillé's administration the larger career of the university began, and a worthy successor was found in Dr. William Pepper, who was inaugurated provost on February 22, 1881. A new creative period in the history of the university now began, rendered memorable by the founding and equipment of fourteen new departments and the erection of thirteen new buildings. In order to extend its influence as a center of learning and research, the university has aimed to establish the principle that it is organically a part of the municipality of Philadelphia. Fully appreciating the importance of this fact to the city, the Councils in 1872 and in 1883 voted the transfer to the university of splendid tracts of ground in consideration of the establishment of fifty free beds in the hospital for the poor of Philadelphia, and of fifty prize scholarships in the college, to be awarded to graduates of the public schools of Philadelphia. Subsequent accessions of territory from the city authorities have brought the domain of the university up to fifty-two acres in a compact body.

The university is in right, and should be in fact, the crown of the educational system of the entire Commonwealth. The expense of modern research practically necessitates resources which, as a rule, only the State can adequately furnish. But the university received no great contribution from the State until 1779, when

a grant of escheated lands, valued at $66,666.66, was made. No other large appropriation was received until 1871, when the Legislature granted the sum of two hundred thousand dollars for the building of the university hospital. In 1895 another appropriation of two hundred thousand dollars was received from the State for the purpose of improving the college department. By this act the Legislature of Pennsylvania gave complete recognition to the university as a State institution, and at the same

WILLIAM PEPPER, LL. D.,
Provost of the University from January 12, 1881, to June 7, 1894.

time widened its sphere of usefulness. Mr. Charles C. Harrison succeeded to the provostship in 1894, and he at once outlined a liberal policy in an appeal for an endowment fund of five million dollars.

The demand for a special kind of education has been promptly met by the university by the multiplication of new courses of study, three hundred and thirty courses having been offered during the past year. The courses are arranged in elective groups, and the degree of Bachelor of Arts is conferred on graduates who

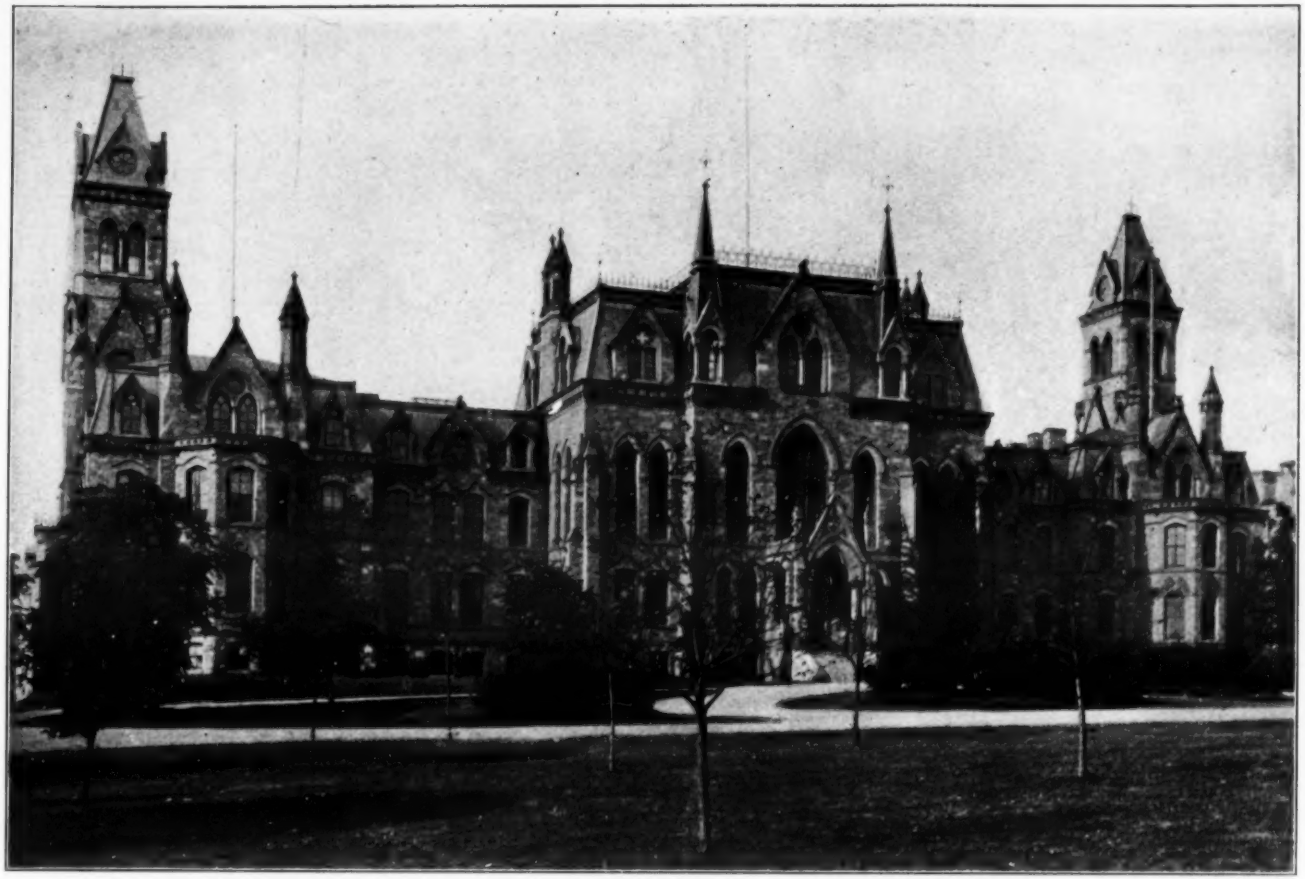
have taken Latin and Greek during the freshman and sophomore years. The new impulses of the century are shown in the fact that the degree of Bachelor of Science is granted in eight different departments or schools. Besides these, courses are also offered in the Department of Philosophy, the Department of Law, the Department of Medicine, the University Hospital, the Auxiliary Department of Medicine, the Wistar Institute of Anat-

CHARLES C. HARRISON, A. M.,
Provost of the University.

omy and Biology, the Laboratory of Hygiene, the Department of Dentistry, the Department of Veterinary Medicine, the Museum of Archæology and Paleontology, the Flower Astronomical Observatory, and the Department of Physical Education. These various departments at present constitute the University of Pennsylvania.

The highest intellectual life of the university is found in the Department of Philosophy, devoted to the work of research and investigation. The courses are open to college graduates, and

lead to the degree of Doctor of Philosophy. This department, established in 1884, is modeled after the philosophical faculty of the German universities. The growth of the department has been rapid. In 1884–'85 there was one matriculate; during the present year the enrollment has reached one hundred and seventy-one. The possibilities for original work and scientific research in the Department of Philosophy have been greatly increased through the generosity of Provost Harrison, who has presented to the university a permanent fund of five hundred thousand dollars, known as the George Leib Harrison Foundation for the Encouragement of Liberal Studies and the Advancement of Knowledge. Upon this foundation have been established twenty-seven new scholarships and fellowships of the aggregate value of thirteen thousand two hundred dollars annually. The purpose of the adoption of the new system is to build up a group of cultured men residing among the students of the university. The twenty-seven scholarships and fellowships are divided under three classifications. Eight are of the value of one hundred dollars a year, and are open only to graduates of the university, intending to provide for those students who desire to take an extra year of study. Fourteen are fellowships, of the value of six hundred dollars a year, less one hundred dollars devoted to publication, and are open to the graduates of any institution to be held for two years in candidacy for the degree of Ph. D. The Hector Tyndale fellowship in physics, already established, makes fifteen of this grade. Five are senior fellowships of the value of eight hundred dollars a year, open only to those who have taken the degree of Ph. D. at the university. These fellowships may be held for three years, and the holders are required to devote themselves to some work of original research, and to do teaching in the line of their work to a maximum of four hours a week. The intention is evident that the plan aims to retain men of exceptional ability in residence as long as possible. A graduate of the university may hold a scholarship or fellowship for six years, while a graduate of another institution who displays great ability may be retained in residence for five years. Besides the above mentioned, there are also six fellowships in the graduate department for women. It is believed that the university has now the most complete system of fellowships in the country. With a material equipment of grounds, buildings, etc., valued at three million nine hundred and sixty-five thousand dollars, vested funds to the amount of one million nine hundred and ninety-two thousand dollars, the most liberal system of fellowships in the country, a teaching force of two hundred and fifty-one professors and instructors, and a student body numbering twenty-six hundred and thirty-two, the university has peculiar facilities



College Hall.

not only for the work of instruction, but also for research and investigation.

It will be impossible within the scope of this paper to adequately describe all the various activities of the university, so I shall confine myself to those departments in which the chief contributions to science have been made. The Department of Archæology and Paleontology, which illustrates the prehistoric antiquities of America, as well as the remains of highly developed Oriental civilizations, has enlisted the services and energies of the ablest scholars. As a result of their labors, the University of Pennsylvania has put the scientific world under lasting obligations by placing the slumbering witnesses of nations that have perished at the service of science. The Museum of Archæology and Paleontology may trace back its humble origin to the spring of 1888, when a few casts and squeezes of Babylonian inscriptions, some Etruscan and Roman pottery, a number of Palmyrene tombstones, and other miscellaneous antiquities were gathered together and placed under the care of the Professor of Assyriology, Dr. Hermann V. Hilprecht. On October 23, 1889, a little company met at a dinner given by Mr. Francis C. Macauley, at the Philadelphia Club. There were present Dr. William Pepper, then provost of the university; Dr. Joseph Leidy, President of the Academy of Natural Sciences; Maxwell Sommerville, the collector and student of engraved gems; Dr. Daniel G. Brinton, the Americanist; Dr. Horace Jayne, dean of the university faculty; Dr. Charles C. Abbott, the well-known archæologist; Henry C. Mercer, Prof. E. D. Cope, and the host, Mr. Macauley, whose enthusiastic interest in archæological research had led him to bring together these distinguished men of science for the purpose of stimulating and extending the interest in archæological studies, and to establish a museum of archæology in the city of Philadelphia. The project from the first received the cordial support of Provost Pepper, and early in the month following it was announced that the university had established the Museum of Archæology and Paleontology, for which a staff of officers was appointed and Dr. Charles C. Abbott installed as curator.

The formation of a museum, however, had only been part of a scheme in which a most important place had been given to the prosecution of original investigation and the arousing of a more general interest in the subject of archæology. To obtain funds for prosecuting explorations and to enlist the support of people of cultivated taste in the work, a society was formed under the title of the University Archæological Association. This organization, which now numbers over two hundred members, has largely contributed to the results achieved. In 1891, in consequence of the great interest manifested in the museum and the successful ex-

tension of its work, it was constituted a department of the university. Its collections are now contained in halls devoted to them in the library. They comprise eight sections, each in charge of a curator, as follows: American and Prehistoric Archæology, Asian and General Ethnology, Babylonian Casts, Egyptian and Mediterranean Glyptics, Musical Instruments, and Paleontology.

The American Museum occupies a spacious hall. Long rows of flat cases fill the center of the room. In these are contained a carefully arranged collection of the objects of stone, bronze, bone, and pottery which comprise the few material evidences of the presence of man on the eastern part of this continent before the arrival of European settlers. There are displayed the rude stone implements from the Trenton gravels, the discovery of which carried back the antiquities of man in America to a period hitherto undreamed of, constituting an era in the science of American archæology. There are also finished stone implements of the recent Indians, and the fragments which alone remain of the rude Indian pottery. These specimens are arranged State by State through almost the entire Union. The exhibition space is at present chiefly occupied with the Hazzard collection from the cliff dwellings of Mancos Cañon in southwestern Colorado. Here, under the wide dome of the Library building at the university, is a little colony of people and things estimated to be two thousand years old. The village was discovered by two brothers named Wetherile, in 1888, in the heart of the cañon of the Mancos River in Colorado. They bought up the village at a very low figure, and sold it to Mr. C. D. Hazzard, of Minneapolis. Mr. Hazzard showed a part of his wonderful collection at the World's Fair, and Mr. Stewart Culin, of the university, secured it for exhibition in the museum. The collection represents in an almost unbroken series the entire life of these strange people, telling in plain words more about them than we know now about the warring Indian tribes which inhabited the eastern coast of North America. This exhibition shows that in the wilds of the Rocky Mountains, where this curious colony of people were driven for refuge by the wilder tribes inhabiting the plains, there existed two thousand years ago a civilization and a culture that will bear comparison with its contemporary countries throughout the world. The Mexican antiquities consist chiefly of objects from graves, among which are a number of cinerary urns, with their original contents of calcined human bones. From Peru there is a highly important collection of pottery from the ancient sepulchres, with mummies and a number of the simple objects, such as food, weapons, and household implements, which the Peruvians were accustomed to bury with their dead. From the islands of the Pacific may be seen the weapons and pottery, the carvings of

MUSEUM OF ARCHÆOLOGY.

wood and bone, the ornaments, headdresses, and costumes—all, in fact, that made the savagery of those strange lands of the South Sea so remarkable and distinctive. In it is reflected the spirit of that island civilization that spreads from the far South to the Alaskan shores of the Pacific.

The results of the explorations conducted by the department in Florida, the caves of the Ohio Valley, and in Yucatan have been of the greatest scientific importance. The explorations of Mr. Charles B. Moore in the shell mounds of Florida produced a case of selected objects which filled a most important gap in the collection of the American department. During the past few years Mr. Henry C. Mercer, Curator of American and Prehistoric Archæology, has visited the most important prehistoric sites of Europe. The university museum has thus been enriched by European collections, such as are to be found in no other museum in America. He made sketches of French caves, where the oldest objects of human skill have been discovered, and where pictorial art of a striking character has been found in drawings upon the bones of the mammoth and the cave bear. Mr. Mercer has also explored the floors of the mountain caves of Yucatan for traces of pre-Indian occupation, continuing the systematic search for evidences of the existence of palæolithic and glacial man, which he had carried on with negative results in the Ohio and Mississippi Valleys. The caves yielded nothing older than the pottery of the Maya Indians of the time of the conquest, verifying Maya traditions that they found the country uninhabited when they entered it, ages ago, from the North. Mr. Mercer's observations have practically demonstrated that the antiquity of man in America is more recent than in Europe, as shown by the human remains found in European caves.

No piece of work done in America in a decade has so elevated the European estimate of American scholarship as the recent explorations in Babylonia under the auspices of the university. In the summer of 1888 the University of Pennsylvania equipped and sent out the first American expedition to the northern half of the plains of Babylonia to effect a thorough exploration of the ruins of Nippur. A short time before this a few citizens of Philadelphia had met in the house of Dr. William Pepper and formed the Babylonian Exploration Fund, with the purpose of effecting a systematic exploration of ancient Babylonia. Two professors, Dr. J. P. Peters and Dr. Hermann V. Hilprecht, were intrusted with the management of the expedition. The explorations were conducted amid the greatest difficulties, the chief ones being the deadly climate and the hostility of the natives. But the excavations were pressed on with energy and confidence, under the gracious protection of the Sultan of Turkey and Hamdy Bey, the Director-

General of the Imperial Museum in Constantinople. The explorers penetrated deeper and deeper into the secrets and riddles of the huge mound of ruins at Nippur. Hundreds of graves, clay coffins, and urns were opened, and the ruins of demolished habitations and storehouses, along with the contents of their chambers, were explored. In this way thousands of documents, inscribed bricks, vases, and votive tablets were collected. Evidences of the activity which once pulsated in the streets of the city were unfolded before the eyes of the restless explorers. The terraces of the Temple of Ekur were disclosed. Numerous bricks bearing the name of the great Sargon came forth to the light of day under pickaxe and shovel. Under the building of Sargon one of the most important finds rewarded the labor that had been expended. An arch of brick was laid bare, and by this the question long discussed by the historians of architecture as to the antiquity of the arch entered upon a new stage, and its existence in Babylonia at the beginning of the fourth millennium before Christ was proved. The excavations have not yet reached the deepest foundations of this venerable sanctuary, whose influence for over four thousand years had been felt by all classes of the Babylonian people. But in the presence of this fact we begin to have some notion why Nippur is spoken of as the oldest city of the earth in the old Sumerian legends of the creation. Nearly seventy thousand dollars have already been spent on the excavations in Nippur, and great sacrifices of time, money, and personal devotion will be needed to carry the exploration to its end. Among the most important objects secured for the university museum may be mentioned about thirty-five thousand cuneiform documents in clay. The Babylonian Museum is the most important in America, and ranks immediately after the British Museum and the Louvre.

The classification and editing of the numerous and important results of the expedition has been intrusted to Prof. Hilprecht, who has planned their publication in four series of from ten to fifteen volumes each. Two volumes have appeared already, three are in the press, while seven others are in preparation. During the summer of 1893 Prof. Hilprecht was sent to Constantinople by the Babylonian Publication Committee to examine the inscriptions of the cuneiform tablets which had been deposited there according to the laws governing the disposal of such objects in the Turkish Empire. Hamdy Bey, Director-General of the Imperial Ottoman Museum, requested Prof. Hilprecht to reorganize the Semitic section of the Imperial Museum and furnish the basis of a catalogue of that section. Dr. Hilprecht complied with the request, and since that time he has acted as curator of the section. In March, 1896, Dr. Hilprecht again sailed for Constantinople to

classify and read the cuneiform documents excavated during the last two years in Nippur. During the summer he will also complete the reorganization of the Semitic section of the Ottoman Museum.

The lectures of Miss Amelia B. Edwards, in the fall of 1889, aroused considerable interest in the subject of Egyptology. Several thousand dollars were contributed by the Archæological Association, and the work of excavation was begun by Flinders Petrie. Valuable collections of Egyptian antiquities were received in return at the end of the seasons, and Mrs. Cornelius Stevenson was elected curator of the newly formed Egyptian section.

EGYPTIAN HALL—MUSEUM OF ARCHÆOLOGY.

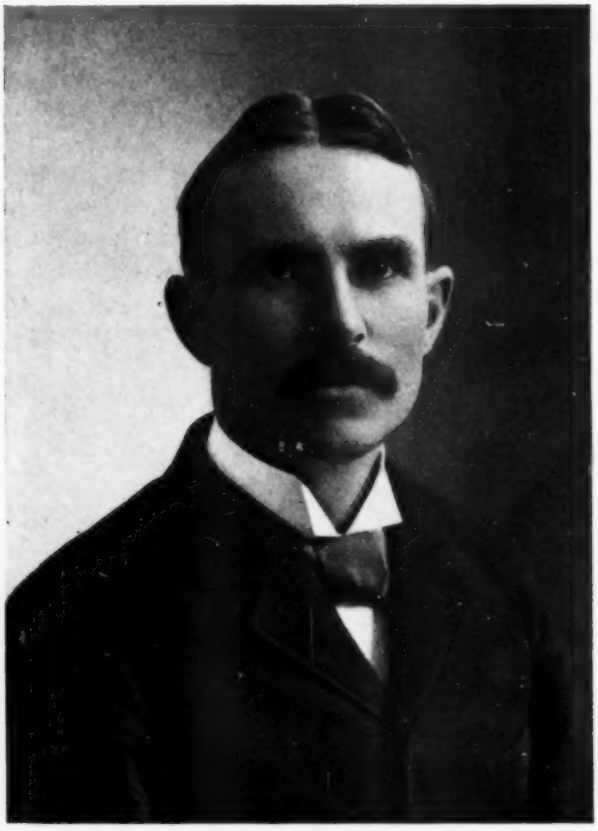
The museum contains a historical and industrial series of Egyptian objects from the fourth dynasty down to the Ptolemaic times. A collection placed on exhibition March 20, 1896, is of the greatest interest to science. Things sunk to earth between the years 2800 and 3500 B. C., illustrating the life of the Libyan invaders of Egypt, were brought to light a year ago by Flinders Petrie, the explorer. About thirty miles from Thebes, in the oldest Egyptian tombs, a most unexpected and startling discovery was made. There were found burials of strange un-Egyptian interlopers, whose large numbers and peculiar mode of disposing of their remains, as well as the implements, pottery, stone work, etc., composing their funeral deposits, show them to be not only intruders, but intruders who had once swept over the region, bor-

rowing little or nothing from the people whose land they occupied. The recent exhibition is of the utmost interest to scientists, as it throws light upon the darkest age of Egyptian history, bringing us into contact with the neolithic culture of Europe, which we find transplanted at that remote period upon the banks of the Nile, and it gives us the means of tracing connections with the products of the Mediterranean peoples back to at least 3000 B. C.

The work of the museum has grown so rapidly that, in spite of the liberal accommodations allowed the department in the new Library building, only a portion of the material can be exhibited, and even the facilities for storage are becoming wholly inadequate. As early as 1893 the project of erecting a museum building for the suitable display of the collections was taken up by Mrs. Stevenson. Through the influence of Dr. Pepper, the city authorities conveyed to the university a tract of land for the purpose of establishing thereon a free museum of art and science. In 1895 the trustees of the university applied to the Legislature for an appropriation, one hundred and fifty thousand dollars of which is to be devoted to the erection of this building. Plans have been adopted, and ground will be broken soon. The entire scheme as proposed represents an outlay of about two million dollars. Here will arise one of the most important adjuncts to general culture, not only for the students enrolled upon the college register, but for people of intelligence throughout the city, the State, and the entire country. This department receives no return from students in fees or emoluments. It is a gift to them and to the public, supported entirely by private benevolence.

Literature and philosophy form subjects of investigation just as interesting as any other evidences of civilization. The important place of modern languages in the college curriculum has attracted a great measure of attention in recent years. Although at first introduced from the standpoint of utility, they have come to be treated as languages to be investigated philologically, and as possessing literatures to be studied historically and critically. The University of Pennsylvania has been foremost in taking this view of the modern languages. By the Professor of German and the recently added Professor of Romance Languages both French and German philology are taught, courses in Gothic and old French being offered to such as desire them; and in both languages, as well as in Italian, the literature receives full attention. English, by the addition of courses in Anglo-Saxon and English philology, has followed in the same direction. Students may now not only obtain large practical drill in the use of their mother tongue, but may also learn something of its origin, its history, its growth, and of the linguistic laws that govern it. Sanskrit sup-

plies the necessary stepping stone for the study of comparative philology, while Hebrew paves the road for any who desire to enter upon the field of Semitic studies. The youngest daughter of Philology—Assyriology—has attained full development with surprising swiftness, and the ruins of a highly developed civilization have been unearthed, accompanied by a unique literature graven in stone and clay. The ancient history of Western Asia has for the first time been placed on a sure footing, thus enabling



Rev. George S. Fullerton, Ph. D.,
Vice-Provost of the University.

us to write one of the earliest and most important chapters in the history of our race.

The university is at present doing much valuable scientific work in the history of philosophy, psychology, and pedagogy. Dr. George S. Fullerton, Professor of Philosophy, conducts a graduate course in ancient, mediæval, and modern philosophy, attended by more than sixty students, many of them being connected with the public-school system of the State either as

superintendents or principals of schools. Dr. William R. Newbold, Assistant Professor of Philosophy, is carrying on investigations in a field of natural science in which results are hard to attain. An inquiry into the character and condition of states of belief, undertaken some seven years ago, led him to the study of the active side of mind in general, with special reference to the origin and function of its more complex elements, such as states of belief, practical intuitions, ethical conceptions, choice, and reasoning. Dr. Newbold is working upon these problems from such points of vantage as may be offered by the study of the less highly evolved forms of consciousness, as in the lower animals and in children, and in those disintegrations of the more complex forms found in hysteria, epilepsy, trance, and hypnotic states. The greater part of Dr. Newbold's work, however, is not yet in shape for public use, and is not likely to be for several years to come.

In no department of the university has there been a greater advance in improved methods than in psychology. With the growing equipment of the university in laboratories, museums, and library, it has become possible to put new methods into efficient practice. By experimentation in laboratories the students are brought into close personal contact with the subject-matter of their studies. A student of psychology has open to him the courses delivered in the medical school on anatomy and physiology, and he has opportunities for dissection. He may attend clinics at which nervous patients are treated, and he has courses to choose from on mental pathology. There are opportunities to become familiar with the types of mental diseases by actual inspection of cases, and within easy reach are asylums for the insane and institutions for deaf-mutes and for the blind. The department of Experimental Psychology at the university was organized for the prosecution of original research, and for the teaching of psychology to undergraduates and to graduate students. The laboratory is the oldest in continuous existence of all American laboratories of psychology in which regular courses for students are offered. It was founded in 1887 by Profs. Cattell and Fullerton. The former was a student of Wundt's in Leipsic, where he was the first assistant in the Psychological Institute. He was the first Professor of Experimental Psychology at the university, and introduced the research and demonstration methods of the German laboratory. Dr. Lightner Witmer, the successor of Dr. Cattell, was a student of his, and also of Wundt. Thus the laboratory of psychology at the University of Pennsylvania was one of the earliest outgrowths of the great foundation of Prof. Wundt at Leipsic. The German laboratory is more of an institution for conducting and encouraging original research than for giving instruction. The American laboratories tend to subordinate

original research to teaching, or at least equal prominence is given to both. The psychological laboratories at the university are situated in the biological building. Psychology, as one of the sciences of human life, thus takes its place among the other biological sciences. Its connection with philosophy has been a close one, and will probably always remain so. Physiological and experimental psychology are required courses in the philosophy group of undergraduate studies, as well as forming parts of the natural history and biological courses. The work of this department consists of undergraduate courses in physiological and

LABORATORY OF EXPERIMENTAL PSYCHOLOGY.

experimental psychology and graduate courses of comparative studies of systems, child psychology, and laboratory work. The laboratories have a complete equipment of all necessary apparatus, including instruments for measuring the time it requires to react to a sound, light, touch, or electric spark. The essential instruments of the series are two time-recording devices, the chronoscope and the chronograph. By means of many experiments with the chronoscope, it has been found that multiplication and division are longer processes than addition and subtraction. Thus, it takes every subject a little longer to think that two times five is ten than that two plus five is seven. Experiments with the chronoscope are being made on the simple reaction time of all classes of persons, and on the time that it requires them to perform simple movements. The movements tested are of the right

and left hand, both from the body and toward the body. It is found that Indians are the shortest reactors, but they can not make the movements of the arms much more rapidly than whites or blacks. Experiments are also being made for the purpose of studying the effect of mental states upon muscle contractions. If the tendon just below the knee-cap be struck, it is known that the foot kicks out. This is called the knee-jerk. It varies greatly from time to time in amount. Mental conditions affect it; a sound or an intense light will increase it. Many experiments show that a mental state instantaneously alters the conditions of muscle contractions, even though such muscle contractions be not directly associated with that mental state.

Pedagogy is a subject closely related to philosophy and psychology, but its introduction into American universities is comparatively recent. Probably the University of Michigan first demonstrated what could be done in a strictly professional way to fit young men and women for the best positions in the school system, when, in 1879, the department of the Science and Art of Teaching was organized. The subject was brought into prominence at the University of Pennsylvania in 1891, when the Public Education Association of Philadelphia appropriated two hundred and fifty dollars toward the establishment of a chair of Pedagogy in the university. This was followed by a sufficient appropriation by the university to establish such a professorship, beginning in the autumn of 1894. Dr. Martin G. Brumbough was called to the chair, and in one year the wisdom of establishing the new department has been demonstrated. Graduate courses in the institutes and the history of education are offered, besides which there is a Saturday class open to the teachers of Philadelphia and vicinity. The enlargement of university Pedagogy has been one of the great needs of the State and the nation, and the present movement will result in calling to the university the best men to examine these questions in their universal relations and study education as philosophy.

While the departments of History and Politics are not within the scope of this paper, the sociological field work, recently begun by Dr. Samuel M. Lindsay, of the Wharton School of Finance and Economy, promises results of the greatest interest to science, and deserves a brief discussion here. Dr. Lindsay studied sociological methods in Paris and other European cities. In 1894, Prof. M. Cheysson, of the *École libre des sciences politiques* at Paris, made a splendid beginning in the way of sociological field work. With his students, regular excursions were made to the shops, schools, restaurants, stores, and factories of the city. In every case the students came away with valuable impressions and new light on the many problems of the management of labor. At present Dr.

Lindsay is carrying out a similar plan of sociological excursions at the university. Regular trips are made to the large business establishments, and to the various charitable and reformatory institutions, slum districts, etc. A thorough investigation of the condition of the colored population of Philadelphia is contemplated in the near future. An assistant in sociology is to be appointed for next year, whose special work will be an investigation of the negro, Italian, and other foreign population. The College Settlement Association of Philadelphia will co-operate with the university in this work, by furnishing an assistant in carrying on the proposed investigation.

An important contribution to science has recently been made by Dr. George E. Fisher and Dr. Isaac J. Schwatt, of the mathematical department of the university, in their translation into English of Durège's Elements of the Theory of Functions. Dr. Schwatt has also written A Geometrical Treatment of Curves which are Isogonal Conjugate to a Straight Line. This work called forth the following commendation from the eminent French mathematician Vigarié: "The work has been admirably conceived, and in my belief it is the first essay of the kind that has ever been published."

As early as 1775 David Rittenhouse, sometime vice-provost, published an oration on astronomy, but wrought more than he wrote. The erection of an astronomical observatory as a department of the university has been an unfulfilled desire until the present. In 1876, Reese Wall Flower, of Delaware County, Pennsylvania, bequeathed to the university a large sum of money for the erection of an astronomical observatory. Among the assets turned in to the university as a part of this sum was the farm in Delaware County known as the Flower farm. It happily offered the most available site for the observatory, the erection of which is now under way. The observatory buildings, three in number, consist of the equatorial building, the meridian building, and the residence of the director, Prof. Charles L. Doolittle, late of the Lehigh University. The principal instruments comprising the equipment are an equatorial of eighteen-inch aperture, with spectroscope; a meridian circle and a zenith telescope; and a three-inch universal transit. Graduate students in astronomy will be instructed in the details of observatory practice, and will be expected to participate in the regular work. The outlined plan contemplates systematic observation of comets and small planets, investigation of various latitudes, and spectroscopy. A small observatory for the convenience of undergraduate students will also be erected in the Botanical Garden on the university grounds, thus making the large observatory free for advanced work.

The John Harrison Laboratory of Chemistry, recently added

to the group of imposing university buildings, affords superior facilities for scientific research and investigation. This large building contains on the first floor a laboratory for beginners that will accommodate over three hundred persons. There are also assaying rooms provided with twelve large furnaces, a balance room, a gas-analysis room, and a technical laboratory where preparations can be made upon a large scale. The second and third floors contain museums, lecture rooms, and private laboratories for advanced students. Electrolytic work is a leading feature in the laboratory. Since 1888 sixty-three investigations have been made relating to the use of the electric current in the

BIOLOGICAL HALL, UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA.

determination and separation of metals. These include studies in the above, and also in derivatives of what may be called the rare metals. At present, important investigations are being made in the following subjects: Electrolytic determination of the atomic weight of mercury; atomic weight of arsenic; and two investigations involving a study of the very rare minerals columbium and tantalum. Within the past few years, nine important theses, the work of graduate students, have been published, and at present there are fifteen persons pursuing chemistry as a major subject for the Ph. D. degree. Dr. Edgar F. Smith, the Professor of Chemistry, is much interested in special electrolytic work.

His book on Electro-Chemical Analysis has recently been translated into German by Dr. Max Ebeling, of the Technical School of Berlin.

For more than a century and a half Philadelphia has evinced a profound tendency toward studies in the natural sciences. Bartram's Botanical Garden was started in 1728, and Marshall's in 1773. During the past century the university made repeated attempts to establish studies in the natural sciences, and these efforts were finally ended, in 1884, in the organization and opening of the Biological School. Just before this, Dr. Horace Jayne, of the university, had gone abroad to examine the most celebrated

WISTAR INSTITUTE OF ANATOMY AND BIOLOGY.

laboratories of the Old World. He became fully convinced of the need in Philadelphia of a well-equipped biological school, separate and distinct from any other. He gave himself to the task of developing the school, and Provost William Pepper joined heartily in the movement. Although the services of the Philadelphia Academy of Natural Sciences have been vast, its legitimate work has been only original investigation. The general scientific instruction in classes and by laboratory work remained for the Biological School to do. A further advance in higher education was made by opening the school to both sexes alike. In this school has been developed a complete system of education, different from but equal in value to the ordinary college course.

It fills a long-felt want in higher education, by allowing youth of different predilections a choice between two equally valuable lines of mental training. The laboratories of the school are thoroughly equipped with material for research and investigation. The museums are rich in complete articulated skeletons for the study of comparative osteology. The conservatory is filled with a representative collection of plants, and botany is studied from the living organisms. The Botanical Garden, which of late years has not been improved, owing to the lack of funds, is now being beautified by laying out paths, erecting mounds, and the construction of an artificial lake. Dr. Macfarlane, the Professor of Botany, anticipates making it one of the best botanical gardens in the country. For the purpose of procuring rare seeds to place in the garden, Dr. Macfarlane has prepared a list of eight hundred different kinds of seeds to be exchanged with botanical gardens throughout the world. Within the past two years one thousand different kinds have been received from twenty-one gardens located in America, Europe, and Asia. A number of original investigations have been conducted in the school which have produced important economic and scientific results. These studies, published in the contributions from the Botanical and Zoölogical Laboratory, consist of Maize: A Botanical and Economic Study, by Dr. John W. Harshberger; The Correlations of the Volumes and Surfaces of Organisms, by Dr. John A. Ryder; The Embryos of Bats, by Dr. Harrison Allen; and a number of other important works.

Medical science at the university assumes great importance, on account of its early historical foundation. A great stride has recently been made in the progress of the science at the university by the establishment of a four years' course of study and by the opening of new laboratories and museums for research and investigation. The instruction of the medical department of the university is conducted in the Medical Hall, Laboratory Building, the University Hospital, the Pepper Laboratory of Clinical Medicine, the Laboratory of Hygiene, and the Wistar Institute of Biology and Anatomy. It will be impossible even to enumerate all the researches and investigations made in the various medical laboratories. The subject of medical chemistry has for many years been given great prominence. Since 1818 this chair has been held in succession by Dr. Coxe, Dr. Robert Hare, Dr. James B. Rogers, Dr. Robert E. Rogers, and Dr. Theodore G. Wormley, the present incumbent, who was elected in 1877. Dr. Wormley has attained a world-wide reputation by his work on The Microchemistry of Poisons. The course in chemistry amounts to three hours' work per week for two years. There are two chemical laboratories in the medical department, in which practical exami-

nations are made of urine and animal fluids, and of the recognition and recovery of poisons from the animal body. This work is supplemented by a lecture course for two years. Realizing the importance of the subject of medical chemistry, the university authorities are contemplating the erection of a new laboratory equipped with every modern appliance and facility for original work. Perhaps the most important contribution from the Laboratory of Physiology since 1879 is the memoir on the Venom of

THEODORE G. WORMLEY, LL. D.,
Professor of Chemistry and Toxicology, Medical Department.

the Rattlesnake, by Dr. S. Weir Mitchell and Dr. Edward T. Reichert, in which it was shown for the first time that the toxic principles of venom are albuminous substances, and this laid the foundation of the enormous amount of work in the development of our knowledge of toxalbumins, etc. The Wistar and Harner Museum, founded nearly a century ago, is the largest and richest of the kind in the United States, containing not only a great variety of specimens illustrating the normal and morbid anatomy of

every part of the human body, but also a large number of preparations in comparative anatomy. In 1892 the Wistar Institute was established, being the first in America open to the public. General Isaac J. Wistar has given to the Institute a large and costly fireproof building, together with a sufficient endowment to provide means for the original work for which it is intended. While the museum is free for the inspection of all teachers and students, the object of its laboratories is to afford facilities to advanced students only, and the institute is not to supersede the elementary instruction of undergraduate students of the university.

The university aims not only to equip physicians with the skill to combat disease, but also to send forth missionaries of health to provide for the hygienic needs of the people. For this purpose, in 1892, the Institute of Hygiene was established. The discoveries of Pasteur led up to Koch's convincing proof of the part played by minute organisms in the causation of tubercle. One disease after another has been traced to its cause in some tiny agent of mischief. Realizing the value of the many ways thus open to beneficent knowledge, Mr. Henry C. Lea offered to provide the means for the construction of a building for the Institute of Hygiene. The building was completed in 1892, and Dr. John S. Billings became the director. The laboratory is the first structure of its kind erected in the United States, and it opens a comparatively new field of work in this country. Regular courses are given in practical hygiene, bacteriology, and physiological chemistry. The following important investigations have already been made: Sewer gas—a chemical, physical and bacteriological investigation, by Dr. A. C. Abbott, First Assistant; a chemical and bacteriological study of the Schuykill and Delaware water supply of Philadelphia, by Dr. J. H. Wright, Scott Fellow, 1892–'93; investigation into the nature and cause of membranous rhinitis, by Dr. M. P. Ravenel, Assistant in Bacteriology; investigation on the influence of light on bacteria, by Dr. J. S. Billings and Dr. A. W. Peckham. The most important contribution to science from the new Laboratory of Hygiene is the one recently made by John S. Billings, M. D., S. Weir Mitchell, M. D., and D. H. Bergey, B. S., M. D., Assistant in Chemistry in the Laboratory, on the Composition of Expired Air and its Effects upon Animal Life. This valuable study has been published under a grant from the Hodgkins Fund of the Smithsonian Institution. The results obtained in this research indicate that in the air expired by lower animals or by man there is no peculiar organic matter which is poisonous to the animals mentioned, excluding man, and that the injurious effects of such air appeared to be due entirely to the diminution of oxygen or the increase of carbonic acid.

The establishment of the Laboratory of Hygiene was the be-

ginning of the realization of a fond dream that Dr. William Pepper had entertained for many years, that a happy time would come when well-equipped laboratories with adequate endowment would offer the chance for original investigation in medical science. The establishment of this laboratory was followed by Dr. Pepper's gift of the Laboratory of Clinical Medicine, in 1895, founded in memory of his father, the late Dr. William Pepper. The laboratory is a large building of four floors, admirably adapted to the purposes of original work. The gift is unique, in that

LABORATORY OF HYGIENE.

it is made for the specific purpose of promoting and stimulating original research and improvements in methods of diagnosing and treating the diseases of human beings, and of giving advanced and special instruction to men who have already obtained the degree of Doctor of Medicine. The University Hospital will thus serve new uses in the promotion of knowledge, and the investigating laboratory in close connection gives the strongest possible expression to the influence of scientific work upon practical medicine. Dr. William H. Welch said, "To the small number of existing clinical laboratories, the William Pepper Laboratory of Clinical Medicine is a most notable addition, being the first laboratory of the kind in this country, and it is not surpassed by any in foreign countries."

The twelve years' existence of the veterinary department of the university has measured the most eventful and prosperous period

in the history of veterinary science in this country. Among the most valuable results of veterinary work at the university have been the introduction in this country of some of the successful practices of foreign veterinarians in regard to the suppression of diseases among animals and their transmission to men. In this connection the most noted achievement has been the introduction of tuberculin as a diagnostic for detecting tuberculosis in cattle. The valuable and well-known experiments of Dr. E. O. Shakespeare on infectious diseases of swine, and on tetanus, were also conducted at the veterinary department of the university.

The university has taken a new departure in order to make its treasures of art and science accessible to the people. Systematic Saturday courses were opened in the college two years ago for teachers unable to take the regular graduate work of the university. These courses have become so popular that one hundred and eighty-one teachers are now doing special work in the various departments. Estimating that each teacher represents forty pupils, the university, by means of these special courses, exerts a direct influence on more than seven thousand individuals. Dr. Edward Brooks, Superintendent of the Schools of Philadelphia, stated recently that the city school principals in Dr. Fullerton's graduate class alone represented twenty-five thousand pupils. This is but one step toward giving to the general public a share in university instruction, too often restricted to a few. With free museums, new laboratories and new methods, and more liberal encouragement from the State, the university is rapidly approaching the ideal expressed by Prof. Calvin Thomas:

> A university in the German sense is an institution crowning the educational system of a state, treating its students as free adults engaged in a *bona-fide* pursuit of knowledge, offering its advantages at the lowest possible price, sending down its roots into the life of the people, to take thence the sap of its own vitality, and paying back the debt by raising the level of intelligence and adding to the value and dignity of life throughout the entire Commonwealth.

Provost Harrison's great influence with the people of Philadelphia, with his own generosity, has resulted in gifts to the university during the past two years of one and a half million dollars. University instruction, from its very nature, can not be self-supporting, for universities are, after all, charities on a large scale. The recognition which the university is now obtaining from the city gives us every reason to believe that the efforts of the provost will make it possible for us, within the next few years, to do for the educational life of the community, in an adequate degree, what a university as a center of higher culture should do, and at the same time to make large contributions to the sum of human knowledge.

PRINCIPLES OF TAXATION.

By DAVID A. WELLS, LL. D., D. C. L.,
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II.—THE PLACE OF TAXATION IN LITERATURE AND HISTORY.

PART VII.

THE TAX EXPERIENCES OF SWITZERLAND.—Any review of the notable experiences of the Governments of different countries in raising revenue for their maintenance and support would be incomplete if it failed to notice those of Switzerland, where the conditions involved are, to say the least, exceptional, or different in many respects from those of any other government or country. These conditions, stated briefly, are as follows:

A country of comparatively small area—15,964 square miles—and in no small part uninhabitable and practically inaccessible, with a population in 1894 of about 3,000,000 (2,986,848). These conditions may be best appreciated by the following comparisons: Of the four countries that are immediately contiguous to and bound Switzerland, France has an area of 204,092 square miles and a population of 38,343,192; Germany, 208,738 square miles and a population of 49,428,470; Austria-Hungary, 264,264 square miles and 40,810,916 population; and Italy, 114,410 square miles and 29,699,785 population. A comparison with some of the States that in the aggregate constitute the United States also affords the following results: The whole of Switzerland has about one third of the area of the State of New York and one half of its population; one sixteenth of the area of the State of Texas; less than one third of the area of the State of Georgia, etc.

Of the total area of Switzerland, only seventy-two per cent, or an area about as large as the States of Massachusetts, Connecticut, and Rhode Island combined, is classed as habitable and productive; and the soil of this portion does not yield sufficient for the support of more than two thirds of the population, a large percentage of the remaining third finding employment and support mainly in very small industries, occupying only a family. The position taken by Switzerland in the trade and commerce of the world is most remarkable, especially when the various natural obstacles are considered—such as the absence of raw material for her industries, asphalt being the only raw mineral product of which the export exceeds the import—the costly and difficult means of transport, and the restrictive customs established by neighboring and bounding countries. Thus, a comparison of the exports of different countries, in proportion to their population, of manufactured products to the world's markets, shows that

Switzerland takes the lead in respect to values; namely, $37 per capita per annum.

Of other countries, the Netherlands comes next to Switzerland, with a present annual export valuation of manufactured products of $35.60 per capita; then England, $24.60; Belgium, $23.40; Germany, $11.50; France, $11; Sweden, $7; Norway, $4.60; and, finally, the United States, with $3.40.

In respect to comparative aggregate valuations, Great Britain furnished nearly thirty per cent of such exportations; Germany nearly eighteen per cent; and France thirteen per cent, making about sixty per cent for these three countries. The proportionate valuation of the United States for 1894 was 12·16 per cent.*

The principal articles of Swiss exportation are cotton fabrics (printed and embroidered), silks (especially ribbons), food stuffs, cheese and condensed milk, clocks and watches, machinery and carriages, works of art, mineral waters, straw goods, etc.

The leading characteristics of the people of Switzerland are their habits of persistent industry, the practice of rigid economy (in great part by reason of necessity) in their expenditures, a degree of patriotism that is everywhere exhibited and acknowledged, and a remarkable diversity of language. "Three tongues have existed side by side in Switzerland for centuries, and their individuality is recognized in the Federal Constitution, by providing that laws shall be printed in all of them, and that in the distribution of certain offices regard shall be paid to the language of the people for whose benefit the official serves.† Education is compulsory; primary education is free, and the percentage of illiteracy is small—almost nothing.

Their standard of morality may be indicated by the circumstance that about five per cent of the births are reported as illegitimate.

The present political organization of Switzerland closely resembles that of the United States, but is far better entitled to the claim of being free and democratic, and in this respect is probably typically superior to any other Government that exists or ever has existed.‡ Under the present Constitution, adopted in 1874,

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* Address of Theodore Search, President of the National Association of American Manufacturers.

† State and Federal Government in Switzerland. By John Martin Vincent. Johns Hopkins Press, Baltimore, 1891.

‡ "The county, State, and Federal Governments (of the United States) are not democracies. In form they are quasi-oligarchies composed of representatives and executives, but in fact they are frequently complete oligarchies, composed in part of unending rings of politicians that directly control the law and the offices, and in part of the permanent plutocracy who purchase legislation through the politicians." The Initiative and Referendum in Switzerland. By J. W. Sullivan. Nationalist Publishing Co., New York, 1893.

and which practically reaffirmed previously existing conditions, Switzerland became a federated republic, whose proper and official designation is the "Helvetic Confederation," consisting of twenty-two Cantons or States; although the division of three cantons into two demi-cantons makes the total number of federative units twenty-five. The several Cantons elect a Federal Assembly (*Nationalrath*) and a States Council (*Ständerath*) in which are vested the parliamentary government of the country. The first consists of a hundred and forty-five members chosen every three years in the ratio of one for every twenty thousand of the population, the election being direct, with the right of participation by all citizens who have attained the age of twenty years. The second is composed of forty-four members, two from each Canton irrespective of its size, the mode of their election and the term of their membership being left exclusively to the respective Cantons. Clergymen are disqualified as candidates, though they are eligible for election to the Federal Assembly. The chief executive authority is deputed to a Federal Council (*Bundesrath*) of seven members, elected for three years by the Federal Assembly, and who during their term of service can not hold any other office in the Confederation or cantons, or engage in any calling or business. The President and the Vice-President of the Federal Council are the first magistrates of the Confederation. Both are elected by the Federal Assembly for the term of one year and are not eligible for the same office until after the expiration of another year. The salary of the President is three thousand dollars per annum. His prerogatives are very limited. He has no rank in the army, no power of veto, or independently to name any officials. He can not enforce a policy, declare war, make peace, or conclude a treaty, and the name of their President for any one year is even said not to be familiar to the mass of the Swiss people.

The Constitution of 1874 declares, that the Confederation has for its object to insure the independence of the country against foreign control, to preserve the tranquillity and the rights of the cantons, and to increase their common well-being. The Confederation has alone the right to declare war and conclude peace, as well as make alliances and treaties with foreign states, especially commercial treaties. But the cantons reserve the right of negotiating with foreign states any treaty affecting general administration, local intercourse, and police, so long as such treaties contain nothing injurious to the Confederation or to the rights of other cantons. The Confederation may not support a standing army, but every male citizen between twenty-four and forty-four years of age is bound to military service and drill. Those between the ages of twenty-four and thirty-two are designated as the regu-

lar army, and number—officers and men—about a hundred and twenty-five thousand; those between the ages of thirty-two and forty-four constitute the Landwehr (militia), and number about eighty-four thousand. Thus, while no great army seems to exist in Switzerland, the whole able-bodied male population of the country can readily be made into an army. The natural defenses of the country have been utilized to the best advantage, and great care has been expended upon numerous defensive works on the frontiers. No Canton may have more than three hundred men under arms. If disputes arise between Cantons they shall abstain from all recourse to violence or arms, and shall submit themselves to the decision taken upon these disputes in conformity with federal regulations. That is to say, in case of necessity the Federal Council summons the Assembly to act; or it may demand the aid of other Cantons, which are bound to give it, or it is authorized to raise troops and employ them on condition of immediately summoning the Cantonal Councils if the number of troops raised should exceed two thousand, or if they remain under arms more than three weeks.

Other articles of the Constitution regulate the military training and employment of citizens; the power of the Federal authorities in regard to public works; the maintenance of free, compulsory, and non-sectarian education; the principles of taxation and cantonal tariffs, consistently with general free trade; the right of domicile; municipal and communal rights, and the general toleration of religious belief and worship. Nevertheless, the Order of Jesuits and the societies affiliated therewith may not be admitted into any part of Switzerland; and all intervention by their members in the church or in the schools is forbidden. "The exercises of the Salvation Army fell under the laws of the municipalities against nuisances; the final judicial decision in this case being in effect that while persons of every religious belief are free to worship in Switzerland, none in so doing are free seriously to annoy their neighbors."* Freedom of the press, of local trial, and trial by jury are also guaranteed. Previous to 1848 the different Cantons conducted their postal service by different methods; but since that time its control and management, together with that of the railway system of the country, have become exclusive functions of the Federal Government.

Attention is next asked to the Cantonal political organization and government. Every Canton and demi-Canton is sovereign and independent in local affairs and in all other matters that are not limited by the Federal Constitution. In respect to their forms

* J. B. Sullivan. The Commonwealth of Switzerland.

of government, they agree in little else than the claim and possession of absolute popular sovereignty; and differ much in respect to governmental organizations and methods of administration. Twenty-two of the twenty-five Cantons (States) are divided into 2,706 communes (townships); and each commune governs itself in respect to all local affairs, so far as is consistent with cantonal and Federal rights. "The citizens of each commune regard it as their smaller state, and are jealous of any interference by the greater state; and unless the interests of the Canton or the Confederation are manifestly superior to those of the locality, the commune is unwilling to part with its administrative power and jurisdiction over its lands, forests, police, roads, schools, churches, or taxes. In the Cantons in which German is the official language (sixteen in number) it is customary for the adult male population to meet annually in an open-air assembly in a town market-place or on a mountain side, and there propose, debate, and enact their laws, and elect their officers by universal vote; thus deferring to and establishing popular will without resort to any intermediate representative machinery."

The question here naturally arises, How did such a nation or confederation, made up of twenty-two small states differing from each other in many essential features—religious, political, social, industrial, physical, and linguistic—originate? A general answer, based on a large amount of historical research and publications, is that it was due originally to a drawing to a common center of a number of small districts, from the contiguous monarchies of Germany, France, and Italy, for common defense against a common foe; and hence also it is not surprising that the political boundaries of Switzerland do not follow the natural configuration of the country.

The revenues of the Confederation or Federal Government of Switzerland in 1894 were estimated at 84,047,312 francs ($17,000,000), and its expenditures at 83,675,000 francs. The various Cantons of Switzerland have their own budgets of revenue and expenditure. For 1895 their combined budgets indicated a revenue of about 78,880,000 francs ($15,600,000) and an expenditure somewhat greater, making a nominal aggregate of about $33,000,000 to be annually raised by some form of popular contribution or taxation. As a considerable part of the cantonal revenues is derived from the proceeds of taxes imposed and collected by the Federal Government, and as contributions are made in turn to the latter by the Cantons, it is not easy to estimate the present annual average *per-capita* burden of taxation on the people of Switzerland; but, making all allowances, it is certainly not inconsiderable. Some years since the average tax burden on every inhabitant of the

Canton of Zurich, the most populous and richest of the Swiss Cantons, was reported at 40·15 francs ($8).*

A further question of interest and importance that now arises (and which constitutes the main subject for consideration in the present chapter of this series) is, Under what system and by what methods is this certainly large average *per-capita* obligation for the maintenance of the several governments of Switzerland apportioned and collected? And as a help to a proper understanding of this problem the foregoing somewhat detailed description of the nature and functions of these governments has been thought necessary.

For the Confederation or Federal Government of Switzerland, which is not allowed to levy direct taxes, the main source of revenue is the customs (duties) on imports, which are levied and collected on the frontiers of the republic. Originally the idea on which it was sought to base the Swiss customs, was to tax all articles of commerce entering from foreign countries on a single uniform plan, having regard solely to financial and not to prohibitive or protective results; and this same idea prevails at the present time. "Changes in the customs have been made in recent years to correspond to new conditions or new commercial relations, but the Government has always kept as near free trade as good financiering would allow. The system of assessment of duties on imports differs from that of England, in that instead of a few articles being selected to stand as much duty as they will bear, a large number—almost every commodity in fact—is taxed a little. The schedule of rates contains over eight hundred articles which are subject to import duty." †

As a rule, raw materials necessary for manufactures are admitted free of duty, and while the principle of imposing the highest duties on luxuries is fully recognized, the duties on articles of general consumption are very light; tobacco paying from two to four cents per pound, tea about four cents, coffee one cent. Export duties are levied upon a very few articles, chiefly on timber, live stock, and certain raw materials. As recently as 1848 each Canton imposed cantonal tariff duties on imported goods, but these have now been abolished with one curious exception, namely, that of salt. The sale of this article being a monopoly of the state, whether its production be domestic or foreign, but its retail price being regulated by each Canton for itself, the supervision of the imports of salt into each Canton becomes necessary.

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* The present aggregate of all forms of taxation imposed for defraying all the expenditures of the Federal Government of the United States is equivalent to an average of about $6·538 per head of all its population.

† Vincent on the Government of Switzerland.

By a statute passed in 1887 the manufacture of alcoholic liquors was made a state monopoly. The net proceeds of the business as thus conducted are considerable, but the entire net receipts are distributed among the several Cantons in proportion to their population. Smuggling and other evasions of the law under the new system are acknowledged to be extensive and irrepressible, so that the measure in question is yet generally regarded in the light of an experiment.

As this subject is one of special interest in other countries, it is thought expedient in this connection to submit a presentation and review of it as recently made by Prof. John Martin Vincent, Professor of History in Johns Hopkins University, and published in a book entitled State and Federal Government in Switzerland, 1894:

"The right to manufacture the higher grades of distilled spirits belongs exclusively to the Federal Government of Switzerland. This is effected by contract either with home or foreign distillers, but at least one fourth of the quantity required must be manufactured by domestic companies to whom the Government makes allotments from time to time. In order to encourage agriculture, the distillation of certain native fruits and roots is exempted from the monopoly and made free to any one. The Government is also the distributer of liquors in quantities not less than one hundred and fifty litres (a litre = 1·05 quart), and fixes the prices. Spirits used for technical and household purposes must be sold at cost of manufacture, and before delivery must be reduced by the addition of wood spirits or other mixtures which render them unfit for drinking. The peddling of liquor from house to house is entirely forbidden except for the kind last mentioned. Retail dealers require a license from the cantonal authorities, and pay a graduated tax according to the amount of their sales. The traffic in quantities above forty litres is considered wholesale and under no restriction. The administration of the liquor business is therefore entirely in the hands of the Federal authorities until the spirits reach the retail dealers; there the Cantons step in to regulate the number and the character of the dramshops, to make the necessary sumptuary and police laws, and exact such license fees as may seem best. The net profits of the government management are collected by the Federal authorities, but divided entirely among the Cantons in proportion to population. The Cantons on their part are obliged to expend at least ten per cent of this dividend in suppressing the evils of intemperance, and to report annually to the Federal Government. Distilleries, in order to continue operations, must be large enough to supply one hundred and fifty hectolitres (a hectolitre = 26.4 gallons) a year. The monopoly is protected from competition by foreign countries by

a duty of eighty francs per hectolitre upon all high-grade liquors imported, and by a graduated scale of duties upon all containing less than seventy-two per cent of alcohol. No one except the Federal Government is permitted to import alcohol for industrial purposes, because the reducing process must undergo inspection in order to prevent fraud. In getting its supply for the home market the Government may purchase three fourths of the demand for all kinds of spirits anywhere it chooses. The other fourth, as mentioned above, must be of home manufacture, and the Government has not exceeded that limit, because spirits can be bought cheaper abroad than at home."

The financial operations of this branch of administration in 1891 amounted to about 13,660,000 francs, from which the net revenue was 5,830,000 francs ($1,165,000). "This net gain was chiefly due to the mercantile profit on liquors for drinking purposes, since industrial spirits must be sold at cost. Hence, as a business enterprise, the monopoly is certainly a success. When we inquire into the moral and social results, there is at present less that is tangible to be observed. The expectation of the promoters of the scheme was that the evils of drunkenness would be reduced, both by decreasing consumption and providing a purer quality of drink. This latter end is obtained by Government inspection, not only of the monopoly distilleries, but also of the smaller establishments manufacturing free products."

"In the matter of consumption there would seem to have been a decrease. In 1885, before the introduction of the monopoly, the total demand of distilled liquors for drinking purposes was about 150,000 hectolitres, while in 1889 the amount sold by the Federal Government for such use was 67,242 hectolitres. But it would not be safe to say that the country had become temperate to this extent, for there is strong reason to believe that much of the reduced alcohol intended for the arts is either purified again and used for drinking, or consumed outright in its mixed state. The use of liquor will by no means be brought under control so long as the distillation of low grades of fruit spirits and the manufacture of malt drinks are under no restriction. No one can tell whether the apparent decrease in consumption is not merely a diversion of appetite to applejack and absinthe, or perhaps to an increased use of wine and beer."

Small amounts to the credit of the Federal revenue also accrue from the postal and telegraph service, from the lease of public domains, the monopoly of the manufacture and sale of gunpowder, from military exemptions, and the like; but the aggregate income from these sources is comparatively unimportant. The powder monopoly at one time yielded considerable revenue, but when new and more powerful explosives came into favor the

profits were greatly impaired. The income from the Federal domains amounts to about five tenths per cent of the total revenue. The largest item of expense to the Confederation is the army, which requires nearly forty per cent of its entire revenue. "Although carrying on no wars of its own nor joining in the conquests of other countries, Switzerland is compelled to undergo this great expense in order to preserve her neutrality and the integrity of her borders."

The comparatively recent tax experience of the twenty-two Cantons of Switzerland has been very peculiar, and different in many respects from that of any other country—a result that might naturally have been expected from their respective governmental independence, jealousy of other cantons, internal antagonisms consequent on the division of each canton into subgoverning *communes*, and in the radical differences in respect both to language and religion.

The taxation of property in general (or the so-called *general property tax*) has been thoroughly tried in Switzerland and, although substantially abandoned in all other European countries, is still adhered to, and constitutes an important feature in the fiscal system of all the Swiss Cantons. In the case of realty the tax is levied on the *capital*, and not upon the annual value of the estate. In the case of personal property everything is taxed, whether it yields an income or not—furniture, pictures, jewelry, carriages, etc.; but furniture and trade appliances up to the value of $1,000 are exempted.

With a view to the successful enforcement of this kind of taxation almost every conceivable method has been devised and adopted, such as self-assessment in the form of compulsory returns on the part of the individual; assessments by officials on assumed data, oaths and no oaths, publicity and secrecy; and all of these, as has been the experience of the United States in the same line of policy, have been confessedly ineffective. One institution, however, has been developed in recent years that is peculiar to Switzerland, and that is the so-called inventory method (*inventarization*). "As soon as a taxpayer dies his entire property is at once seized by the Government and held until an exact inventory is made of it. If this discloses fraud in the previous self-assessments, punitive taxes must be paid, ranging in some cantons over a period of ten years." That such a method of tax administration has and will prove effective in increasing tax receipts can not be doubted, but its objectionable features are no less evident. Thus it intrudes upon the privacy of families, for the purpose of fixing seals upon their property, at a most inopportune moment, and seeks evidence of the violation of law, "as it were, in the very chamber of death." It also offers a bounty

for the effective transfer of property by its owner in anticipation of death.*

Considering that a greater equality of fortune prevails in Switzerland than in almost any other country, it is somewhat remarkable that it has taken lead of all countries in instituting a system of *progressive* or *graduated* taxation, and has made it applicable not only to property but also to income and inheritance taxes.

Graduated taxation now exists in a majority of the Swiss cantons, and in only a few is there any prescribed limit to the progressive rate of assessment. The graduation is applied in different ways. In some Cantons, estates (real and personal) are classified according to their amounts. The rate of the tax is the same, but a varying proportion of the value of the estate is exempted. Thus, in the Canton of Zurich the tax is levied on five tenths of a property valued at four thousand dollars, six tenths on six thousand dollars, seven tenths on ten thousand dollars, eight tenths on twenty thousand dollars, nine tenths on forty thousand dollars, and on the entire estate when exceeding forty thousand dollars in value. In other Cantons, as Aargau and Schaffhausen, an addition of varying percentage is made to the property tax according as the tax at the normal or ordinary rate exceeds a certain specified amount. Thus, in the former Canton, every one who is assessed for a tax of from forty to seventy francs in amount must pay five per cent additional; from seventy to one hundred francs, ten per cent additional, and so on, until those who are assessed at over five hundred francs pay thirty-three per cent additional. In the latter Canton every one assessed at over five hundred francs pays fifty per cent additional. In other words, the tax is graded and made progressive by adding a certain percentage, not to the taxable property, but to the amount of the tax according to a proportional ratio.

In some of the Cantons, as Vaud, Basel, and Zug, real property is divided into three classes: (*a*) under five thousand dollars, (*b*) five thousand to twenty thousand dollars, (*c*) twenty thousand dollars and upward, and a land tax which is enacted each year falls on these three classes in the proportions of 1, 1½, and 2.

In some of the Cantons personal estate is divided into seven classes and taxed in the proportions of 1, 1½, 2, 2½, 3, 3½, 4; the tax being levied on the capital and not on the annual value of the estate. In most of the Swiss Cantons the progressive or graduated system of taxation in respect to property is also made applicable to incomes, inheritances, and bequests; and as a rule the progressive scale in these respects is more sharply graduated

* Essays on Taxation, Prof. E. R. A. Seligman, p. 387.

than in the case of property taxation. "Another peculiar feature of the Swiss taxes is that the progressive rate is applied separately to the income tax and the property tax. A taxpayer with twenty-five hundred francs income from property and twenty-five hundred francs from labor will be assessed separately for each, and will pay less than if he had five thousand francs income either from property alone or labor alone." (Seligman.)

There is, furthermore, no pretense of uniformity in the different Cantons in the practical application of the progressive system. In fact, it is stated that in no two Cantons are the rates of tax and the classification of the subjects of taxation identical. In the taxation of incomes the average rate does not generally exceed four or five per cent; but in some Cantons the rates rule as high as seven and even ten per cent. Where income exists without a corresponding capital, as from wages, earnings, and life annuities, an exemption is generally made of eighty dollars a head for each person dependent on the head of the family for support. Thus a bachelor earning one thousand dollars a year would pay about fifteen dollars, while a married man with the same income and twelve children would pay nothing.

Taxes on inheritances and successions in Switzerland—which are levied in most or all of the Cantons—are characterized by extreme variations on rates, ranging from a very small percentage in some cantons to twenty and even thirty per cent in others, in the cases of the remote, or non-relatives.

Apart from the federal and cantonal systems of taxation in Switzerland, there is a third system which is regarded as distinctive, and under the name of *local* embraces special and separate assessments for the purpose of defraying local or communal expenditures—i. e., police, preservation of forests, roads, schools, and the like. A leading characteristic of such taxes is, that they do not embrace the idea of progressive or graduated assessments; and in their chief incidence on local tangible property do not permit any material reduction of appraisements, or valuations on account of any incumbent indebtedness—mortgages and the like—as is the practice in the appraisements of like property for cantonal taxation. A household tax and a poll tax are also, to some extent, features of Swiss local taxation.

Of the varied subjects of taxation from which the Swiss Cantons mainly derive their revenue, the following classification and exhibit of those of the Canton of Vaud in 1887, the third largest canton in respect to population, though not in area, will serve as an illustration:

1. Public lands, forests, and salt monopoly.
2. Licenses to retail tobacco, wine, and spirits.
3. Taxes on dogs, saddle horses, carriages, and billiard saloons.

4. A tax on all transfers of real property (*droit de mutation*).

5. An annual tax on the capital value of real property (*impôt foncier*).

6. An annual tax on the capital of all personal property and on incomes (*impôt mobilier*).

The last three taxes are the most important and productive, their united product being equal to about nine tenths of the entire revenue.

Concerning the results of this novel and complicated system of taxation in Switzerland there is great diversity of opinion. That it is not uniform throughout the comparatively small territorial divisions of the country to which it has been made applicable, only a very few Cantons being reported as in agreement; that no fixed rules governing progression or gradation in assessments have been generally agreed upon and established; that the practical administration of the system is in the highest degree arbitrary; and that the ascertainment of the tax that an individual or estate shall pay often involves a series of complex and difficult computations and additions, are all points in respect to which there is no question.

The anomaly and gross inequity of double taxation on one and the same property, contingent on the circumstance that the *situs* of the property and the domicile of its owner are not within the same territorial and governmental jurisdictions, and which is at present a subject of much discussion and deprecation in the United States, is also a vexing problem in the system of taxation in Switzerland; two different communes, as a rule, making demands of a taxpayer by reason of his holding a landed estate in one and residing and exercising the rights of a citizen in the other, and the probability of any just and satisfactory solution of this perplexing problem is as remote in one country as in the other.

Notwithstanding the above and other objectionable features, the people of Switzerland appear to be generally satisfied with their fiscal experiment, and thus far have exhibited but little disposition to change it; and all the most important Cantons that have tested it report a steady increase in their aggregate valuation of both property and income. Even the extreme high rates of taxation assessed on large properties and incomes—amounting in some Cantons almost to confiscation—have not been generally regarded with disfavor, but probably for the reason that the number of persons in Switzerland who are liable to such assessments is comparatively limited.

On the other hand, it is contended that any fiscal gain that is reported under the new system has been more than counterbalanced by depreciation in land values and injury to local trade. In

the Canton of Vaud, for example, where the new ideas are specially exemplified, wealthy families are reported as having left the Canton, and that many of its citizens regularly close their houses for nine months in the year in order to evade the law. Foreigners, too, are said to be less and less anxious to reside in the canton. In consequence of this, it is claimed that many properties in Vaud have depreciated fifty per cent, and that trade suffers greatly. Whether all these allegations are true or not, it is significant that a proposal to introduce the Vaud system into the Canton of Berne was rejected by its people by an overwhelming majority.

ADDENDUM.—Readers of the chapter on the Tax Experiences of India, in the preceding number of the Popular Science Monthly, have written to ask if there is any explanation of the remarkable difference in opinion respecting the material condition of the people of India, recently expressed in the British House of Commons (and quoted) by two of its members, Mr. J. S. Keay and Sir Richard Temple, both ex-officials of long service in the Government of India, and having had large opportunities for becoming acquainted with the country.

The explanation is probably to be found in the old story of the two knights who differed and quarreled about the mottoes on a suspended shield, by reason of exclusively viewing it from opposite sides. India is a vast country, about half as large in land area (square miles) as the United States, exclusive of Alaska, and with a population of 287,000,000, so widely separated by caste, language, and religions, that districts and villages that have been in close contiguity for long periods practically do not know or have intercourse with each other. In those portions of the country where the inhabitants are fairly intelligent, have learned to avail themselves of modern methods of agriculture, and have irrigation and transportation facilities, the production of foods and other commodities is so far in excess of any domestic demand, as to admit of such a large and constant export of grain stuffs as to threaten disturbance to the markets of Europe and the United States, besides textiles, fibers, dyestuffs, opium, oils and oil seeds, hardware, sugar, etc. In other districts of large population where the people still plow with crooked sticks, do not even recognize the value of manures or other fertilizers, are almost entirely lacking in facilities for transportation, and are so bound down by caste that it is difficult to induce them to emigrate to districts—like the Assam tea-producing sections—where labor is in good demand at comparatively high wages—in such districts the increase of population so presses on its ordinary food supplies that, in case of any deficiency in the average crops, famine always ensues, and

is only mitigated by the aid that comes through the extraordinary pension fund established and distributed by the British Colonial government. The Duke of Argyll, who has been Secretary of State for India, tells us that "those only who have had any share in the government of India can know what the anxiety is arising out of such conditions of population"; and extensive emigration is now advocated as the best remedial action that can be taken. Making allowance for different standpoints of observation, Mr. Keay and Sir Richard Temple were, therefore, both right in their conclusions. D. A. W.

TO THE READER: With the publication of the chapter in this number of the Popular Science Monthly on "The Tax Experiences of Switzerland," the first part of the plan laid out by the writer for discussing the Principles of Taxation comes to a conclusion. This plan, apart from an introductory survey of the subject, and a review of the interesting and most instructive tax experiences of the United States consequent on the civil war, and with which the writer (as chairman of the United States Revenue Commission in 1865, and as United States Special Commissioner of Revenue from 1866 to 1870), was officially and closely associated (Chapters I and II), was to set forth the position of taxation in literature and history; and more especially to narrate the most notable experiences of different countries and nations in compelling contributions or exactions for the support of the state from the people governed, and the far-reaching and important results that have been contingent upon and have followed the different policies that have been adopted for such a purpose. The underlying idea that suggested this plan was as follows:

Every person of ordinary intelligence, if questioned, will probably admit that the subject of taxation is one of the most important that can concern the masses of the people; and that their well-being and the continuance of good government, and even of civilization itself, are more dependent on the involved power of its administration and discretionary incidence than upon any other agency—a power so great that its right exercise in even the smallest degree, according to the late Chief-Justice Marshall, "involves the right to destroy." And yet the same citizen will probably say that the subject, as ordinarily presented and discussed, is so dry and uninteresting as to be exceedingly unattractive, and even repellent; that the conflict of opinion on the part of those who through study claim to understand it is so diverse that any general concurrence of opinion in regard to fundamental principles is impossible; and, finally, that all experience shows that by reason of this state of things mercenary and political considerations necessarily predominate in the construction of any general system of taxation.

It is obvious that under such circumstances it must be difficult or impossible to induce the masses of the people to intelligently interest themselves in the subject of taxation, and that in countries like the United States, where under free and universal suffrage the same people elect the legislators who shall determine the policy of their Government, laws will be enacted for the collection of revenue for the support of the state that will be neither productive or effective, and do not promote, but rather impair the industrial and commercial interests of the country.

The question, then, next suggests itself, How can a different state of things be brought about? How can the people in general be induced, in the sense of persuasion and not of compulsion, to interest themselves in this subject? The idea of the writer is that such a change can best be effected by showing that the subject is not necessarily dry and uninteresting; that it really constitutes more than almost any other element the essence of history; and that the record of the results that have followed the attempts to establish almost every form of taxation that human ingenuity can devise, has even in a very high degree the attraction of romance. Its study from such a point of view constitutes a better basis for casting a horoscope of the future of nations and governments than aught else within the ken of the historical student.

In the foregoing chapters the writer has attempted to carry out this idea. That it has been in at least a degree successful is demonstrated by the great number of commendatory letters that have come to him from different countries—even China—and from people of most varied interests, situations, and occupations.

In the chapters that are to follow, where a search for the underlying principles of taxation is to be prosecuted, a resort to more or less abstract reasoning is a necessity. But even here the presentation of abstract principles, to which assent will be asked or expected, will be avoided as far as possible, with the expectation that the reader will, from a consideration of the facts and deductions presented, be able himself to frame and determine the principles that should govern a correct system of taxation by a process of self-evident induction.

AN interesting illustration of the interdependence of organisms, and of the existence of close relations where no relations are suspected, is pointed out by Miss Ormerod. Water-cress farmers are greatly annoyed and often have to suffer considerable destruction of their crops by the depredations of the larvæ of caddis flies. These larvæ are delicious morsels for trout, and where trout abound they are scarce and the cresses flourish. But if heron abound, they destroy the trout, the caddis flies are not eaten up, and the cresses are.

THE STONE FOREST OF FLORISSANT.

By Prof. ANGELO HEILPRIN.

TO the many who annually wander forth in quest of a "change of scene," and have not yet fully exhausted the wonders of Nature in their search after the purely beautiful, any locality that offers material for special wonderment comes with pleasing interest. One such, which is less generally known than other localities of a somewhat similar character in the United States—indeed, is hardly known beyond the pale of a limited coterie of geologists—is the region of ranch and meadow land which lies within a mile and a half of the line of the Colorado Midland Railroad near to the station of Florissant. In reaching it we have crossed the front or outer range of the Rocky Mountains, traversed

The Giant Stone Forester of Florissant, Colorado.

the charming flower gardens of Summit Park at an elevation of nearly nine thousand feet, and have again descended to eight thousand one hundred feet. A gently undulating plain of meadow-land is in the main occupied by Costello's and Halthusen's ranches, and around and about sweep up the chain of heights which help to make up the great backbone of the North American continent. There is little to suggest in this landscape that we are in the heart of the Rockies; the rugged crags to which the mind has affectionately attached itself from childhood's study are hidden beneath a dense covering of piny woodland, or else wander off much in the manner of the Eastern Appalachians. Here and there in the not

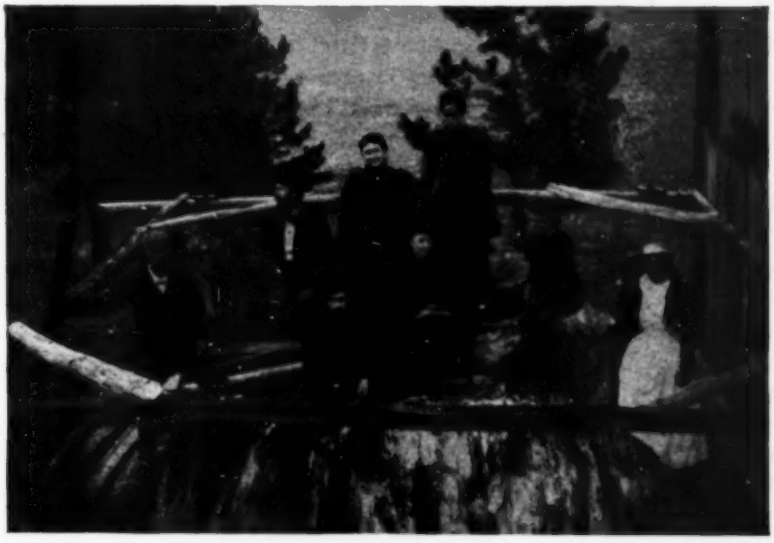
very distant horizon a peak looms up with special prominence, and occasional patches of snow indicate that the mountain crests lie well above the thirteen thousand and fourteen thousand foot line, for below that line, and generally even above it, the lingering winter snows rapidly depart before the summer's heat. The two thousand feet advantage that we possess in the elevation of this region over that of Mount Washington is in no way indicated by the thermometer; an almost subtropical sunshine warms up the open expanse of the Rocky Mountain parks, and with it there are but few reminders of the chilly blasts that habitually sweep over the crests of the White Hills.

Florissant has long been famous with geologists for the wealth of insect remains which its rocks harbor. No other locality of the earth's surface, not even the famous Oeningen beds of Switzerland, has disclosed an insect fauna of equal variety and abundance, or with characters so well preserved as they are here. From butterfly to beetle, wasp, dragon-fly, and ant, almost every type of this great group of animals belonging to the period of the making of the Florissant rock is represented in the soft and thinly bedded shales which here and there force themselves through the not over-luxuriant covering of sward. If, perhaps, the better specimens have by this time been culled by the ever-grasping geological collector, many yet remain, and with rapture the eye follows the marks of hair and exquisite venation which have withstood a time action of perhaps one hundred thousand to two hundred thousand years.

My own purpose in visiting the Florissant Basin during the past summer was less for the study of its extinct animal remains than for inspecting the *débris* of the wonderful forest which ages ago had undergone its transmutation into stone, and now reads its own history from monuments which are destined to live for equal ages in the future. With me were a number of students, of both sexes, who had determined to share the pleasures and discomforts of camp travel, from cañon to mountain peak, and to whom the quasi-luxuriance of the big Rocky Mountain coach was in no way an obstacle. A few hours' easy journey across the Hayden Divide brought us from our quarters at Green Mountain Falls, on the northern shoulder of Pike's Peak, to the land of ancient lake and dead volcano, where, under the kindly guidance of the ranchero and his amiable daughter, we were almost immediately put in sympathetic touch with the relics of departed life.

To the geological mind the Florissant Basin is an ancient silted lake, the waters of which succumbed to that sure infiltration of sediment which marks the beginning and end of nearly all standing bodies of continental waters. In this case, however, it was not the deposition of sediment within the lake by inflowing streams

that produced the lake's annihilation, but in the main the aërial discharges of volcanoes. Even to-day the practiced eye will soon pick out from among the many mountain forms that surround this ranchland the conical contours of the volcano. A few such stand by themselves, neither of great height nor of imposing mass; others are disposed in linear series, much like the cones which so abundantly scatter themselves over the southwestern and Mexican plateaus. We ascended one of these, a conelet of perhaps one hundred and fifty feet elevation, whose partially wooded sides were yet the ancient slag and cinders, and from whose top projected the plug of lava which marked the position of the former vent. In a pit near by could be seen the hard



THE GIANT STONE FORESTER (SEQUOIA) OF FLORISSANT. Forty-five feet in circumference.

basalt-trachyte which forms the existing core of the mountain—the material which in early Miocene times, or perhaps still earlier, was active in the distribution of the loose rock fragments which everywhere lie scattered about. In the days of its activity the foot of the volcano bordered a still more ancient lake, or was even immersed in it, as the lacustrine deposits which largely encircle it plainly show. In these are found in scattered spots a number of fresh-water types of mollusks—*Planorbis, Physa, Limnea, Valvata, Cyclas*—their shells as beautifully preserved as the much more delicate parts of the insects which were shortly added to them.

The eruption came, and with it clouds of ash sailed upward, only to fall back into the lake waters, and with them form a sticky and lasting paste, ultimately to harden into a compact

rock. This is to-day the floor of the basin, and in it are wrapped the thousands of insects which at the time disported in the subtropical sunshine, and whose lives were involved in the catas-

A Rocky Mountain "Park," across the Florissant Basin, Colorado.

trophe. Fish remains are still occasionally met with, but they do not appear to be in any way abundant. The heated waters flooded portions of the adjacent dry land, and destroyed the stately forest that grew down to the banks—the forest of giant redwoods (*Sequoia*) which already then clothed this portion of the North American continent, and whose extension is to be found in the forest heaps of Patoot and Atanekerdlook on the western coast of Greenland, almost under the seventieth parallel of north latitude. It was a different climate then. The *Sequoias* do not, perhaps, teach us much, since they, or a closely allied species, are still a part of the vegetative product of California, and are to-day a wonder in their own land; but when they reared their majestic trunks above the plains of Florissant, they did so in association with palms and with other representatives of the southern climes. They fell together, and together have their remains been preserved.

The silicified trees of the Florissant Basin are a marked curiosity of the United States. They are less known than the "stone forest" of Arizona, or than the similar mausoleum of the Yellowstone region, but it is only because they have not yet been brought to the attention of the tourist. The trees are at the present time represented only by their stumps. In wandering over the green meadow the eye here and there rests upon a seem-

ingly "bald" spot. Over it are scattered white and yellow chips, and, for anything that the eye can itself distinguish, these could easily be the chips left in the path of work of a recently passing woodsman. The deception is absolute, and it belongs to the stump as well. The knots and gnarls and annular rings are perfectly preserved; the bark stands in prominent relief both by ruggedness and color, and all this not in wood, but in the monumental substance of stone. The precise manner in which the substitution of silica for wood was effected can not now be learned, but, in a general way, we know it to have been brought about as the result of a slow infiltration into the tree trunks of heated waters containing silica in solution.

The remains are fairly numerous, but what strikes one with special astonishment is the giant size which some of them attain. Diameters of six, seven, and eight feet are by no means uncommon, and we measured three specimens which spanned ten feet or more. In most instances the stumps hardly rise above the surface, coming up flush with it; therefore, without excavation, it is impossible to say at what height above the roots the measurements were taken. In what might be termed the "king of the forest"—the tree represented in the accompanying illustrations—a definite basis for measurement is presented, inasmuch as the tree has been laid bare to its roots. The stump stands about fifteen feet high, and at that distance above the roots it measures forty-five feet in girth—a colossus that would hardly be shamed by its more gigantic brethren of the existing redwood forests of California. This, so far as I have been able to ascertain, is the *facile princeps*

THE GIANT STUMP. About fifteen feet elevation.

of stone foresters—a curiosity in Nature of which the world offers but few duplicates. Imbedded hard within the trunk, and held by it fast as in a vise, are the blades of two gang saws, the wreck of a barbaric effort to section the tree and remove it in parts to the World's Columbian Exposition. It is stated that this effort at desecration was only abandoned after it had involved the expenditure of some three thousand to four thousand dollars.

Near by is a stump whose surface measures eleven feet in diameter, and it may well be that excavation nearer to the roots would disclose a size fully equal to that of its more "costly" neighbor. All in all, the trees in this region are much larger than those of the "petrified forest" of Arizona, and their comparative antiquity gives them a special claim upon the attention of the geologist. In the more southerly tract they rarely attain a diameter of four or at most five feet, and more generally two and three feet give the full measure. Most of the fragments lie prostrate—an indication that there was a subversion of the forest before petrifaction set in, and it is difficult to find pieces of more than four feet continuous length. The trees, so far as botanical study has determined them, were pines, and not the more stately *Sequoias* of the north. And yet, even with such forms, a giant stature was not exactly absent, for only a short time back a prostrate shattered trunk was measured over a length of about a hundred and fifty feet. It is, by way of contrast, a little remarkable that at Florissant so many (perhaps most) of the trees still retain an upright position, a condition that suggests peaceful decay, or at least one that was not associated with any cataclysm of the land surface. In whatever way overwhelmed to death—and the falling ash would itself be quite competent to effect this—it seems not unlikely that silicification proceeded to a level prescribed by the surface of the heated waters of the lake, above which the trees fell. It would be a satisfaction, certainly, to have excavations conducted here; but whether carried out or not, the region is one that stands with its own interest, and to which the tourist can safely be recommended to carry his explorations in search of Nature's wonderland.

SOME remarkable sculptures in ivory—described as being executed with marvelous art and great vigor and accuracy—have been discovered in a cave at Brassempouy, near Pau, France. They are assigned to the beginning of what the French archæologists call the Magdalenian period or the end of the Mousterian. One of them exhibits the features of prominent haunches and pendant breasts which are often seen among the Hottentots and other African tribes; another, a head, presents a Basque physiognomy, and bears a coiffure carefully arranged in parallel braids so as to resemble an ancient Egyptian headdress.

THE AIM OF MODERN EDUCATION.

By Dr. C. HANFORD HENDERSON.

IN venturing to speak or write about a topic so much spoken about and so much written about as education, one may be pardoned a little hesitation. In the midst of our present wealth of educational theories, the need seems not so much for any addition to them or any restatement of them as for a little genuine, wholesome action in carrying them into effect. And yet this problem, the education of our children, though so very old and so much discussed, is always new and never exhausted. The last word has not been spoken.

This perennial interest in education springs, I think, from two sources—from a feeling that much of the current action that goes under the name of education is obviously ill-advised, and from an appreciation of the tremendous importance of the whole matter. For, mark you, what we propose to discuss is no more nor less than this—the unfolding of the human spirit. It is a process for whose preparation the mighty drama of evolution has not been counted too great; and, now that that drama has become in our hands a conscious process, we can scarcely overestimate the unique significance of this, its concluding scene. It is an august problem, one that I stand before in reverence and humility.

In a day of more childlike faith one can readily conceive the attitude of mind of those who, in the presence of such an issue as this, devoutly waited for the working of the Spirit, and listened to its utterance as to the oracle of God. But though the old faiths are dead, or at least certain aspects of them, there is a new faith no less inspiring and no less revered. Modern faith believes in the essential sanity of the human spirit. It believes that it is possible by pure and holy living to so strengthen and clarify the spiritual vision that one may catch some glimpse of the divinely human truth. And this glimpse comes not to one man alone but to you and to me, when together, in the disinterestedness of a common purpose, we attempt to let the light play about the problems of the inner life.

And first let me say, in considering the aim of modern education, that I do not do so as the advocate of any special system or of any limited cult. I am in no sense a special pleader. It may be known to some of my readers that I have had for several years the charge of a manual training school in Philadelphia, and the thought would be quite natural that I may have come to regard the salvation of childhood as dependent in some occult way upon the training of its extremities. But, believe me, this is far from the truth. We hold, rather, the deep conviction that the province

of secondary education is to lay broad, general, catholic foundations for the successful conduct of life. We should defeat ourselves by indulging in any specialty, however commendable in itself. What we are after is culture, and the power and perfection that come through culture. It is no new motive. On the contrary, it is a very old motive, as old as the birth of the human spirit itself. But it is still the motive underlying all that new movement in education of which manual training, sloyd, and the kindergarten form so prominent a part. I believe that not all the men and women taking part in the movement would agree to such a statement of motive. Some at least among them would assign more special and technical ends. I make the statement, however, quite unreservedly. What *does* distinguish the new movement is that in the choice of methods it differs somewhat radically from the older efforts. Be kind enough, then, at the outset to distinguish between motive and method, between ends and means.

In speaking about the present demands upon the school I do not think we hit the mark when we confine ourselves to the industrial demands, or the economic demands, or the social demands, or to any other one aspect of a very complex problem. Nor do I think we get any place when we propose to offer in satisfaction of these demands any one panacea. I would stand rather upon a broader platform, and ask your sympathy and consent to a much more catholic solution.

The problem of education is forever presenting this double interrogation point: What do you want? How are you going to get it? They are very definite questions, and it is easy enough to give equally definite answers so long as one confines one's self to general terms. We want culture, and the power and perfection that come through culture. We shall get it by surrounding the child with those influences that make for culture. But when we come to translate these general terms into something more specific, and, still more, when we come to translate our words into action, it is then that the difficulty comes; it is then that the educational sun goes under a cloud. Yet, as we love education, we must go on forever asking these questions, and we must go on forever trying to answer them. What we should pray for is clearness.

One of the most difficult branches in the modern school curriculum is apparently mathematics. We are prone to grade the children by their progress in this one branch. Yet it is not essentially difficult. If you will analyze it for a moment, mathematical study is but a study of the quantitative relations of life. It is consequently axiomatic. It needs for its mastery only clear statement. Higher and lower mathematics are equally easy of com-

prehension if they are only clearly stated. It is, I think, this effort after clearness of statement that gives to mathematics its high disciplinary value. The apparent difficulty that surrounds mathematics and has made it a dreaded name to so many generations of schoolboys comes, I believe, from the way we approach the science, and is chargeable to the cloudiness of our own mental atmosphere.

Now it seems to me that we stand toward education in very much the same attitude. It is apparently the most difficult problem that presents itself in modern life. It is certainly the gravest. But here, too, the difficulty lies not so much in the problem itself as in our statement of it. If we could clearly state what we are after in education and stick very close to that, I have large faith that we should be able to get it.

We do not begin *de novo*. Others have been pegging away at the same problem. We find an educational process already in operation, and bearing unmistakable signs of its evolution. It is a process which has grown up in answer to the demands of a varied, and for the most part of a past, life. What we do in the name of education, we do because at some time the circumstances of life made it seem wise. I do not for a moment venture upon the statement that it *was* wise. Much that we do was never wise under any circumstances. But we may readily believe that each element brought into education came in response to some outward condition. Yesterday, as well as to-day, had its demands upon the school. A progressive education would be one in which the educational process was being constantly readjusted to meet these changing conditions. In a rough and somewhat rebellious way this is what does happen. But the readjustment is not easy, continuous, voluntary. It comes by irregular jumps. The old customs have considerable inertia. The mechanical workers, the men and women in whose hands the process of education mainly rests, follow the line of least resistance. And the line of least resistance is to go on in the way one has been accustomed to going on. So it comes about, quite easily and naturally, that the schools get much behind the informed spirit of the time. The process they follow is no longer in harmony with the demands of the life which it is meant to serve, is indeed very much out of harmony with those demands. The children become restless. The teachers find their work difficult. The outside world grows impatient. And now at this juncture some reform is inaugurated. It is hailed, and very sincerely, as an entirely new departure. The reformer is believed to be a radical in either motive or method. But, in point of fact, the reformer and the departure which he proposes are much less radical than they are believed to be. It is difficult to be original, and as rare as it is difficult. All the forces

at work in modern society tend to produce average men. What the reform does attempt is simply this—to bring the educational process once more into harmony with the *Zeit-Geist*. Its office is to sweep away customs and practices that were never wise, and to transform those which were founded in right reason into more modern and available form. This is all that can be done—is perhaps all that it is desirable to do. No single reform can be very sweeping, for observe, it is to operate upon a set of conditions of which it is itself a product. Hence it is that the reforms which are the most far-reaching in their results come from outside, are forced upon our institutions and enterprises by those who stand themselves outside of the movement. In our education we have precisely the same spectacle, a curious one surely, if it were not for this explanation. The movements which are to-day innovations, and which are looked upon by many of us as reforms, have such an outside origin. The kindergarten, sloyd, manual training, science lessons, and nearly all the features that distinguish the newer education, have not sprung up within the curriculum of the school. They have forced themselves into the school from without, and often after a very long struggle. These readjustments are made only at the cost of considerable opposition and heartburn. They are the efforts to bring the spirit from the past into the present. It is the attitude of mind which says, I *am*, not I *was*.

Looking at the schools in this way, you will perhaps agree with me that nothing we do in them is in itself commendable, but is only commendable as it serves some desirable end. Good and bad are relative terms. Schools are good or bad in no absolute sense, but solely in relation to the ends which they serve. Schools which were very good a quarter of a century ago might be relatively bad at the present time. Bear in mind that the school is a tool, a process, a means, is in no sense an end.

As a tool, we can judge the modern school only by the manner in which it does its work. And this makes necessary a clear understanding of the work it is to do. It is here that we need that clearness of expression of which I have been speaking. There is no end to-day of discussion on educational topics. We are all reading papers or giving little talks. We come pretty near to realizing Joubert's famous saying, "It is better to discuss a question without settling it than to settle it without discussing it." But meanwhile the schools must go on, even though the discussion come to no conclusion. This multiplicity of discussion serves at least one good purpose. It directs public attention to the gravity of the problem of education. And yet it seems to me that much of the discussion is idle, and must from its very nature continue to be so. The weakness lies in this, that it is for the most part a discussion of methods and of minor riddles. It is not

basal enough. It does not sufficiently address itself to the question of the sort of men and women we wish to produce. How to get culture will depend upon what you mean by culture. And this can not be stated once for all. It is a shifting ideal, growing as the spirit of man grows.

Perhaps we shall the sooner see our mark by first clearing the ground a little, and disclaiming some of the ends proposed for education. My own list of unadmitted ends is somewhat long. I do not, for example, set as the object for education a good citizen, a successful breadwinner, a wise father, an expert mechanic, an adroit versifier, a keen lawyer, an eloquent preacher, a skillful physician, a learned professor, a prosperous tradesman. Some of these ends may be good enough in themselves. I do not discuss the question. But they are not the proper end of education. And they are not, because they are secondary, minor, special ends. They are not the major ends in life, though they are often mistaken for such. We are pretty far from the mark when we mistake for education any training which has a partial and special end in view. To erect any one of these ends into *the* end, and declare it to be the goal of education, is to fall by the wayside, and deliberately to turn one's face away from the New Jerusalem of the Intellect.

The end in education should be the major end. It should be the very biggest thing in life, the most general and far-reaching good the mind can formulate. We cheat ourselves, we cheat the children, if we express the end in terms any less catholic than this. It may include good citizenship, wise parenthood, successful breadwinning, literary or technical skill, but it is not any one of these things. The greatest thing in life *is* life—life in its fullness and totality. It is this that education should set its face toward. Its end should be wholeness, integrity, and nothing less than this. It is false to its mission if it turn aside into any of the bypaths of convenience, of industry, or even of accomplishment and erudition. These are broad terms that I have been using and somewhat ambitious. But I can say no less than this and say what I mean. Education has to do with the whole of life, with man, and not with any one or any group of his petty activities. He must take an acceptable part in the life of effort, and to do this he must be prepared. There is a time when special technical training is advisable, when it is the proper usurper of the time; but this is quite secondary, a mere supplement to the main business of education. It is a deplorable intrusion if it ever take the place of education. There is a marked tendency in us all to get things out of perspective, to specialize, to confound magnitudes, and, of equal elements in a problem, to see one big and the other small. We are prone to mistake the means for the end.

Now turn to a more cosmic conception. For one moment let us isolate a man. Place him naked and alone in the midst of Nature, in the open sunshine. Clothe him with health and beauty. Endow him with a clear mind, a warm heart, a keen love of perfection. Make him self-poised, resolute, independent. Then bring him into relation with his fellows. Have him share in all the wholesome activities of life. Let him taste of labor and joy. Let him be a son, a brother, a friend, a lover, a husband, a father, a citizen, a worker, an idler, a thinker, an artist. Let him feel. Let him philosophize. This is to taste life in its entirety. Great God, how few of us do it! How slight we are! How partial! And what a tragedy that, in the name of education, we should go on working for fragments instead of for the completed whole! And this figure of the complete man is the figure that modern education has in mind. An impossible figure, you may say. Yet less impossible the more you and I believe in it. Such a figure is not the ideal of the economists, with their extreme division of labor and their strong belief in the economic trinity of production, distribution, and consumption, but it is a figure which appeals to those men who, like myself, believe in what I may call the scientific humanism. As I see the matter, we want to turn boys toward this ideal of full living, to make them *en rapport* with the universe and with man, to bring them out of their smaller into their larger self, to change them from a less evolved into a more evolved existence. We want to create in them a discontent with partial, secondary, minor ends. We want to turn their faces toward the major end. To do this is to magnify the human spirit —that spirit in whose essential sanity I so profoundly believe. And so I define education as the unfolding and perfecting of the human spirit.

I do not know whether my readers agree to this answer of mine as to what we want to do. I hope that they do agree to it, for to believe less would seem to me to make out life meaner and cheaper than it is. This ideal is but a restatement of the old ideal of the earnest pagan world. To see things as they are is the mission of culture. To adjust one's life to this clear perception of things is to gain the power and perfection that come through culture. But our modern complex world has not taken this motive in its simplicity. It has modified it so that now it reads: To see *some* things as they are, and notably those things which have to do with material convenience and progress. This is not life in its entirety. It is life weak on the human, emotional, artistic side, life weak on the side that can least afford to be weak. We are waking up to this fact. We are waking up to a feeling that modern school life *is* rather juiceless. On many sides I see a hopeful discontent—a discontent which is to be the prologue to that intel-

lectual and spiritual renaissance which I doubt not will grace the opening years of the coming century. This is what we want—this fullness of life. Shall we ever get it? My friends, that depends upon us—upon you and me, upon the earnestness and single-heartedness with which we want it. Assuredly we shall never get it if we continue to fix our gaze upon the partial, upon the fragment, and forget that there is such a thing as the greater whole. If you persist in saying, This is good, and That is good, and proceed to build up educational institutions for the pursuit of this and that, what you get will be simply what you pursue—this and that, and naught else. And the result of this pursuit, of this process of emphasizing one or two sides of life and ignoring many other sides of equal or even greater importance—the result is not beautiful, is not encouraging. In many cases the discipline of life at large would be more valuable. It is this feeling that makes me count myself fortunate to have gone to school but two years in all my life.

It would perhaps interest you just here to learn a bit of curious testimony in regard to the practical effect of this pursuit of the partial. It came in my own experience. Before I went to Europe to study I had charge of the science department in our older manual training school, and I noticed, or thought I noticed, that many of my brighter and more promising boys had, for some reason or other, been to school very little, less indeed than the average. The suspicion grew so strong that at last I decided to test it. I had each boy in a certain class write out his age, the number of years he had been in school, how old he was when he started, and whether the school had been public or private. There were some surprises. There were some boys who had been to school for eleven years, who had been through all the dismal grind of the primary, secondary, and grammar schools, and who were still bright and attractive. But the result of the whole scrutiny warranted the remarkable generalization that the brightness and desirability of the boys as pupils was *inversely* proportional to the number of years they had been at school. In a word, I could do more with the boys who had been least in school. Do you comprehend the full significance of this statement? I have never been able to forget it. It has made me critical of school processes and methods. It stands before me a silent specter. I cry aloud, Woe unto us if we are sending our children to school to their hurt!

Let us turn now to that second question, How shall we get what we want?

When I was quite a young man I went over to New York on a literary mission. My purpose was somewhat ill defined, but I think I had it in mind in a vague way that I could be very useful

on the staff of one of the leading periodicals, and, in view of the chaste and elegant English *then* at my command, I fear that I expected a pretty high post. Among others, I carried a letter of introduction to Mr. Roswell Smith, the editor of The Century. He received me very kindly and talked with me for some moments. Finally he said to me: "You want to write?" I said that I did. "Well," he answered, "if you want to write, write," and he held out his hand. The interview was over. As I returned to Philadelphia I could not help the reflection that I had gone a considerable distance for so obvious advice. But do you know, the more I thought over the matter the more I came to the conclusion that Mr. Smith had touched off the position with great nicety. If I wanted to write, there was just this one thing open to me to do, and that was to write. This bit of obvious advice has never quite got out of my head. But it is not a principle which often leads along the line of least resistance. On the contrary, like the Czar's railroad from Moscow to St. Petersburg, it goes in a straight line, quite regardless of mountain and morass. It asks us frequently to oppose what is of all the most difficult to oppose—the wishes and counsel of friends. If you want to do a thing, do it. This is simple advice, but it sometimes takes a hero to follow it. In this matter of education I see no other way open to us. If we want for our children life in its fullness and totality and beauty, we must address ourselves to the task of realizing this, and be contented with no partial solution. It is not an easy task.

Life in its totality—this means twenty-four hours, seven days, four weeks, twelve months, threescore years and ten; it means feeling, thinking, acting; it means the life of the organism—birth, nutrition, growth, reproduction, death; it means the life of the emotions; it means the life of the intellect—acquisition, reflection, creation. It means nothing less than this; and the moral measure of our work as teachers will be the measure of the fullness of life that we open to our children. Were we tried by this standard to-day, I dread to reflect how many of us would be found wanting!

And yet I have said that this gigantic problem, like mathematics, is only difficult in appearance; is in reality quite simple. I believe this to be true, provided, observe, that we can attain a clear statement of the problem, and maintain this clearness in all our dealing with it. And we gain clearness and rationality, the stronger our hold upon the principle of causation. If we really believe in cause and effect and in the necessary relation between them, we will realize that we can never gain complete effects by setting in operation partial causes. This is, indeed, the great lesson in method that we all have to learn. With a clear idea of the

end, we must set going adequate means. The machinery must be competent to do the work. Here it is that the older methods have been found wanting. They do not provide for life in its totality. The answer may well be made that they were never meant to. They attempted to deal only with one side of life—the intellectual. The other side, the emotional, bodily life, was left to the home. This division would not be amiss, if it were possible to so divide the child, and if both school and home were equipped to do their share of the work and received each its due share of the child's time. But this is not the case, and, from the very nature of our being, *can not* be the case. The child is *not* divisible. It is a unit, a *monistic* child. The intellectual life depends for its material upon the bodily sensations, and for its motive and coloring upon the emotions. Separate these, and the result is a crippling of the whole process of education. Separate them very far, and the result is fatal. The emotions are the inner springs of action, and upon the healthy life of the emotions depend the joy and fullness of action. The poets have long known this. It has been the burden of their singing. When we love, then are we strong. It has been with them a divine intuition. It might have been a direct induction, for it is not only the teaching of the poets, but it is the teaching of life. The history of all action is the history of expressed emotion. Every conflict on the world's arena has been the drama of conflicting feeling. Stint emotion, stifle feeling, and there comes the most dreadful of all the soul's maladies—that fatal apathy which makes action impossible and life a stupid slumbering. And when action is gone, when experience is curtailed, when sensations are limited, intellection becomes feeble, for it has no stuff to work upon. Believe me, the most terrible paralysis that can befall the human spirit is the paralysis of feeling, the slow drying up of the emotions. It is this that makes old age a tragedy and life a bitter, juiceless thing. I would that we, who presume to teach children—for it is a presumption—I would that we might early learn this lesson. It would transform us into teachers of men. It is a truth beautiful in its operation when we realize it and act upon it, terrible in its operation when we lose sight of it and deny it. And this same great truth, hit upon by poets and thinkers as they wandered over the open fields or in the deep forests, under the hush of the night or in the broad sunshine, is precisely the truth hit upon by colder methods in the laboratory of the psychologist. We have been discrediting "mere feeling," and asking for something more solid and enduring. It is much as if we scorned the springs and brooks and still asked for broad rivers to float our argosies upon. The emotions are the elements out of which is built the whole life drama. They are the *first* terms in the *syn-*

thesis of life, the stuff out of which each earnest, loving soul builds his world. Likewise, they are the *last* terms in the *analysis* of life, the ultimates reached by the painstaking, fact-loving man of science.

Pardon my too persistent iteration. But I am saying this over and over again, hoping to so say it at last that it will seize upon your imagination and carry us both into a new and more rational comprehension of the problem of education. The child is a *unit*, and neither he nor you can separate his intellectual from his emotional, bodily life. It might be desirable, it would certainly be convenient, if we could present great slices of truth, like a generous help of layer cake, to the minds of our children, and have it thoroughly assimilated by methods prescribed by ourselves in normal schools assembled. But however desirable or convenient, it is not possible. Yet we go on trying—yesterday, to-day—I hope not forever. To do this is to deny causation and invoke the power of magic and the black arts. There is but one avenue of approach to the mind of a child. It is the avenue pointed out in earlier days by loving intuition—that unconscious induction of the untaught spirit—and in later days by the colder scrutiny of science—that conscious induction of the informed spirit. It is the approach to action through feeling, and to thought through sensation. The causal chain is very distinct. It should be well noted: feeling, action, sensation, thought. You see, then, how psychologically impossible it is to reach the last link in this chain without passing through the intermediate links. Yet this is precisely what we attempt to do when we divorce the thought life from the bodily life, and assign the one to the school and the other to the home.

If it were equally agreeable to sit still as to walk, and we happened to be sitting still, we should go on sitting still all the rest of our lives. The balance of pleasure and pain being equal, there would be no motive to action. The absence of desire would be the absence of power. We should be as hopelessly bound to our chair as Prometheus to his rock. In this condition we might be picked up, might even through the application of some external force be made to go through the motion of walking, but it would be an awkward, ungracious act. A better way to get us to walk would be to offer some inducement—in a word, to enlist desire on the side of walking. The internal force is infinitely more efficient than the external. No one can make us walk so well as we can walk ourselves, for walking, after all, is a mental act. No action, however simple or complex, can be brought about without an appeal to the spring of action, and the spring of all action is a feeling, a desire, an emotion. It is perfectly hopeless to ask your apathetic subject, sitting there in the chair, to get up and walk,

unless you offer at the same time some sufficient reason for walking; and observe, please, the reason must be one that appeals to *him* and not alone to *you*. It is *his* desire, not *yours*, that is going to make him stir himself. Is it not the same with a child and his lessons? It is quite as hopeless to ask a child to learn unless you first see to it that he wants to learn. You may force him to go through the motion of learning, just as it was possible to force the apathetic man to go through the motion of walking, may even force the child to memorize the lesson and recite it with verbal accuracy, but it will be an awkward, ungracious act, and will do the child injury rather than good. And the injury is of a very positive kind. It drives another nail into the coffin of desire. By so much is the emotional life of the child dead and are his intellectual possibilities stunted. I am not speaking with picturesque exaggeration when I tell you that in many a schoolroom where this process of drilling children is being carried out, I experience a distinct sensation of spiritual horror, a sense of intense darkness, for I say to myself: Here is accomplished the death of the spirit; here are children growing each day more listless and apathetic, not learning what we want them to learn, and losing in the vain effort what no one can afford to lose—the joyous life of childhood, rich in strong feeling and high spirit, in itself an end of beauty, and a source of perfect manhood and womanhood. In all sincerity, it seems to me an evil greater by far than the evil committed by acknowledged thieves. It is a spiritual robbery, the least endurable of all robberies. I have been often robbed. I have been "held up" in Montana, and robbed by less direct methods in other parts of the world. You have doubtless had similar experiences. But these losses sink into absolute insignificance in comparison with the more dreadful losses inflicted by poor teachers and guides. You have doubtless had similar experiences. The reflection may be made without bitterness, but it ought not to be made without bearing fruit of the most wholesome sort in our own handling of that delicate bit of organism—the mind of a child.

What we must do, then, in educating children is first and foremost to give full and free play to the emotional life. We want consciously and deliberately to encourage feeling and sentiment, and to create the greatest possible number of wholesome desires. This may sound to you like strange doctrine. It will, however, bear your examination. It is easy to cultivate the emotional life in children. All we have to do is not to suppress it. And yet even this negative function, this clearing of the ground, requires *finesse* on our part. What we want in children is totally unconscious sentiment. Children who are well, children in whom the pulse of life beats high and quick, are reservoirs of feeling, bits

of concrete sentiment, bundles of desire. In the majority of our schools we try to crush this all out. What we should do is to encourage it. If we are sympathetic, if we are responsive, if we are wise, we will hesitate to check this flood of feeling. It is to be disciplined, but not destroyed. It is the same with the multiform desires of childhood. Many of them can not be gratified, but the child-life will be fuller and more wholesome if they are allowed as far as may be. And I so value this emotional life, this prodigality of sentiment and desire, because it all leads to action, and to the very sort of action that is educationally the most valuable —to that which is self-prompted. Froebel hit upon this in the kindergarten, and made self-activity the corner stone of his whole system. He could not have built truer. It is a quality found in all children. Those who are full-blooded and have not been constantly thwarted by the cry of "Don't!" have an inexhaustible supply of it, and this is precisely what we want. It is the source of power, and jealously to be guarded. The particular merit of the new education, represented by the kindergarten, sloyd and manual training, lies in this, that they proceed psychologically. They recognize the child's desire as the source of action and effort, and build upon that. What we want to do is to turn these desires into the most wholesome channels, and to have the activity spend itself along the most helpful lines. So long as the desire is genuine, is the child's very own, and the activity which follows, a legitimate result of the desire, we may feel quite sure of the resulting sensations and their assembly into thought. What I dread most as a teacher is the child devoid of feeling and desire, the quiet little mouse who under the old *régime* would be called good and held up as a pattern. To keep quiet and vegetate is not to be good. The troublesome child, full of action and desire, is the far more promising bit of humanity. In the first there is nothing to work upon, poor little anæmic creatures with no past, no present, and no probable future. But the second is a storehouse of power. Education has something to work upon. It has a more lively problem, it is true, and one of some difficulty, but withal a problem of keen interest and large promise. Believing this as strongly as I do, the systems of education which begin by repression, by a process of subduing, quieting, deadening the activities and desires of childhood, seem to me absolutely vicious— more vicious by far than the conduct of nurses who feed troublesome babies with soothing sirups and other detestable drugs to put them to sleep.

The children themselves suggest the right method in education. What they most want is to be employed, and with something that interests *them*, not something that interests mamma or papa or the teacher. Consult any child of your acquaintance

—any unsophisticated child, I mean—and get at his preference for one place over another. I think you will find, for example, that he prefers the shabbiest old farmhouse to the trimmest village mansion; and the reason is simple—there is more to *do* there. This is the great fact that the newer education has seized upon. It attempts to make knowledge real to children by making it a part of their experience, and to do this it enlists the life forces on its side instead of arraying them against it. As educators, we are to use our skill in directing the wonderful self-activity that in children is already a reality. We are to provide the theater for its exercise, and decide, in large measure, what shape it is to take. But always we are to do this with the sympathy and co-operation of the child, and never against his protest. It is bad practice in medicine to deal with symptoms and treat only them. It is good practice to go back of symptoms to causes. It is bad practice in education to attempt to control the occupations and activities of children, and neglect the motive power back of it all. It is good practice to accept the desires of children and allow them wholesome expression. A large part of the childish instinct is the desire to make things, to construct something—anything, indeed, from a mud pie to a canoe or playhouse. It is a wholesome instinct. It is only by such experience that the child comes to know the great outer world and to find himself in it. Think for a moment how much he has to learn; how much that to you and me are mere commonplaces, but to him are brand-new wonders! He is a born investigator, an inquisitive experimenter in a very large laboratory. And not only this, but it is very desirable that he should be. To prohibit these activities, to thwart these instincts, and to deliberately propose as a substitute that he shall sit still indoors with the abstractions of formal education is simply grotesque. If the proposition and the carrying out of it did not involve so much mischief of a very grave sort, they would be highly humorous. No educational ideas are defensible which have not their foundation in ethics, and one's ethics, I need not add, must rest upon one's philosophy of life. In proposing to respect the desires of children, or, in a word, to let them have their own way, I am proposing something quite at variance with the ethical ideas of the majority of people and notably at variance with the Puritan ethics, yet I do it on ethical as well as psychological grounds. It is a moral universe, this, in which we find ourselves—a universe so constituted that health-giving activities are followed by happiness, and evil activities by pain. It is this, indeed, that constitutes the rightness or the wrongness of the action—the good or bad results. If we wish to make the moral life a reality, we must from the cradle up let children feel this essential relation between cause and effect, and discriminate between

good-producing and bad-producing action. You must not misunderstand me. I would, of course, try very earnestly to influence the desires of children, to make them want the things that the experience of the race has shown to be good and wholesome, but it seems to me of greater moment to have the desire and the action harmonize than to have the action which would seem to us always commendable. We would not, I think, run any very great risk. Healthy children, living under wholesome conditions, have, in the main, wholesome desires. And desires that are not wholesome can not be more thoroughly killed than by allowing them, if possible, to flower into action which the child himself will recognize as painful. No greater wrong can be done a child than by associating in his mind what is right with what is painful, and what is wrong with what is pleasant. It is an utterly false association. He will attain the highest morality when he does simply and naturally the thing that is good-producing without any inner conflict, but solely as the result of cultivated instincts.

I read once the gospel credited to John, making careful note of all reference to miracles. I was struck with the fact that all of the reported events had to do with some physical want—the curing of the sick, the feeding of the hungry, the raising of the dead. You will notice in studying the inclinations of childhood a similar uniformity. They are all physical wants, and may be summed up for the most part in two words—muscular exercise. The children are right. It is this exercise that is going to strengthen all the organs and make them capable of more perfect function. Every physical act has its corresponding mental act, and it is a succession of these acts that develops the gray and white of the brain and gives us at last a highly evolved and sensitive organism. The work of education consists in directing these activities into those channels which will yield the most helpful reactions. By concentrating the wandering attention, by increasing the delicacy of touch, by cultivating a finer and finer discrimination, by training the observation—in a word, by developing, as far as may be, each and all of the faculties—we make possible that unfolding and perfecting of the human spirit, that evolution of human nature, which is the end in education.

The goal of modern education is not reached through manual training alone, any more than it is through language or science or mathematics. It is for this reason that I no longer desire to see the establishment of manual training schools as such. They were necessary in starting the movement. This side of things had to be emphasized, and the early manual training schools did yeoman service. But now it seems to me far more wholesome and desirable that manual instruction should be introduced into

the lower and secondary schools already in existence, and that the work should take its place alongside of the other recognized means of culture. It has a substantial contribution to make toward that fullness of life which is the modern aim. It enlarges the experience of children by bringing them into closer contact with the outer world of force and matter; it develops that many-sided interest which gives alertness to youth and redeems old age from *ennui;* it increases the sensitiveness of the bodily organism; it makes possible activities which would otherwise be impossible; in a hundred ways it makes for righteousness—that righteousness which consists of fullness of life.

And the method of the new education is admittedly psychological. It is in harmony with the desires of childhood. It offers occupations which are welcome to the children, and at the same time rich in thought reaction. It is a proposition to educate children through their own self-activity, with their co-operation instead of against their protest.

In estimating the several forms of manual training, I have come to believe that the Swedish form, sloyd, has some advantages over the more formal Russian manual training, in giving better gymnastics in its movements and a more human interest to its occupations. A finished article makes a stronger appeal to the childish sympathy than the abstract exercises of manual training proper. It is psychologically truer and, I believe, morally more effective. Children wholesomely occupied, children busy in trying to realize some form of usefulness and beauty, must, I think, daily grow into that unconscious goodness which I hold to be the highest morality; must illustrate Emerson's favorite doctrine, that evil, like cold, is a negation, is but the absence of good.

I have indicated the ideal in modern education. I have tried to indicate somewhat of the method. The practical question remains: Who shall carry it out? It would be unfortunate to intrust this most important interest of society to any but the best men and women, and by best I do not mean those who know the most, but those who are the strongest, the most beautiful, the most lovable, the most cultured, as well as the most skillful and the best informed. And in the newer education the need for wise and beautiful teachers is particularly great. Now that education has taken this truer and more psychological turn and is building its work upon the basis supplied by Nature, upon the feelings and desires of childhood, upon its wonderful self-activity and constructive instinct, you can readily see how utter will be the defeat if the realization of the method be left in the hands of men and women devoid of the requisite insight. Profoundly as I believe in this aspect of education, in the underlying principles of the kindergarten, sloyd, and manual training, I greatly prefer the

old academic training, with all its defects, in the hands of earnest, cultured men and women, to the most elaborate carrying out of the newer methods in the hands of those who do not see the end and purpose.

Mistakes bear a certain family likeness. The most tangible element in the older education was knowledge. Teachers were selected for their knowledge alone, and education was defeated. The most tangible element in the newer education is dexterity and its product, the finished exercise. But this is likewise the product of our industrial operations. Externally the school and the factory resemble each other. Both make things. But the difference is this, and it is a great one: The school concentrates its effort upon the making, and has regard only to the little workman; the factory values only the thing made, and is indifferent to its effect upon the worker. What a sad travesty when the modern school loses sight of this immense difference! The effort to turn children into artisans, and to do it in the name of education, is quite as unfortunate as the more ancient effort to turn them into encyclopædias. From the very circumstances of the time, it is far easier to establish one of these factory schools than it is to establish a true school. For, observe the teaching material that is available. It is difficult to find men and women of broad culture who can also use their hands. It is very easy to find artisans who are willing to exchange the smaller pay and longer hours of the shop for the pleasanter work of the schoolroom. They believe very sincerely that the only qualification is the ability to turn out good work. I admire their dexterity, I respect their earnestness, but I say to them and I say to you that this is not enough. The artisan habit of thought does not make for the unfolding and perfecting of the human spirit. By the very conditions of his life, the artisan is a man of limited experience, and consequently of narrow views. He is not the sort of man qualified to educate our children. His thought is directed solely toward the product. His skill is in the handling of dead material. What we want is something different from this; it is a man whose thought is on the process, whose cunning is in the handling of the living material, the tissue of childhood.

I have had a distinct purpose in mind in writing this article. I shall have satisfied it if I have gained the reader's assent to three propositions:

1. That the object of modern education is fullness and integrity of living; is the most complete unfolding and perfecting of the human spirit; is the development of the more evolved out of the less involved self.

2. That the method by which this object is to be attained must be psychological. Its foundations must be laid deep in the

emotional life of childhood, in the desires and feelings. It must allow these to express themselves in sincere action. It must preserve inviolate the causal chain of desire, action, sensation, thought. Its philosophy must be monistic. It must hold fast to the organic unity of the child.

3. That the proper agents for carrying out this method and gaining this end are the best men and women that society has produced, the very flower of the race, men and women of large experience and broad culture in whom the pulse of life beats quick and high; not bookworms, not artisans, not fragments of any sort whatever, but men and women to whom Nature and circumstances have been kind, who have caught sight of the vision of the complete life, and who would make this vision prevail.

EARLY YEARS OF THE AMERICAN ASSOCIATION.

By WILLIAM HENRY HALE, Ph. D.,
FELLOW OF THE ASSOCIATION.

IN this age of increasing specialization and multiplying societies and organizations of specialists it is well that there still remains an association broad enough to include the entire range of scientific thought and activity, and comprehensive enough to welcome all who have the disposition to explore any field in the vast domain of science.

The American Association for the Advancement of Science has now for nearly half a century been a powerful factor in stimulating the progress of scientific research in America. Similar associations are found in other countries. The pioneer of all is the British Association for the Advancement of Science, which was founded at York, England, in 1832. The period following this epoch was marked by a great outburst of the spirit of research and investigation among the English-speaking people. In America the science which gained the greatest number of adherents and was prosecuted most vigorously was geology. During the decade following the organization of the British Association, James Hall was laying the foundations of that science in America by his explorations of the strata of the State of New York; Bela Hubbard was exploring the new State of Michigan; Benjamin Silliman was teaching at Yale; James D. Dana completed his college course as a pupil of Silliman, and already made a name for himself in scientific circles; and Edward Hitchcock was finding the puzzling fossil footprints of primeval reptiles, so long erroneously called "bird tracks," along the valley of the Connecticut.

The city of Philadelphia was then an important scientific center. A number of geologists resided there, and were wont to hold occasional meetings. At last it seemed desirable to convene a larger and more general assemblage; and on the 2d day of April, 1840, about twenty geologists, including nearly all the most prominent ones in America, met there and organized "The Association of American Geologists." Edward Hitchcock presided, and Lewis C. Beck was secretary. Of the founders of this association who attended this first meeting, three venerable men still survive—James Hall, of Albany; Bela Hubbard,* of Detroit; and Martin H. Boyé, of Coopersburg, Lehigh County, Pennsylvania. Several of the older States were represented, including Massachusetts, New York, Pennsylvania, Delaware, and Virginia. Of the Western States, Michigan alone had then instituted a geological survey; and Bela Hubbard and Douglas Houghton traveled that long journey together from Michigan to Philadelphia. It took them an entire week, traveling day and night by the most direct route; and the roads in Ohio were so muddy that the passengers often had to alight and assist in pulling the stage out of the mud.

JAMES HALL, surviving founder of the Association of American Geologists and of the A. A. A. S., and oldest surviving past president, Albany, 1856.

The next year (1841) the geologists met again in Philadelphia, and many new members were added. In 1842 the meeting was held in Boston, where several naturalists came into the association, and the name was changed, mainly through the influence of Amos Binney and Augustus A. Gould, to "The American Association of Geologists and Naturalists." Subsequent annual meetings were held in Albany, Washington, New Haven, New York, and Boston.

Several years after the association was founded the chemists and physicists proposed to join, and in 1848 another meeting was

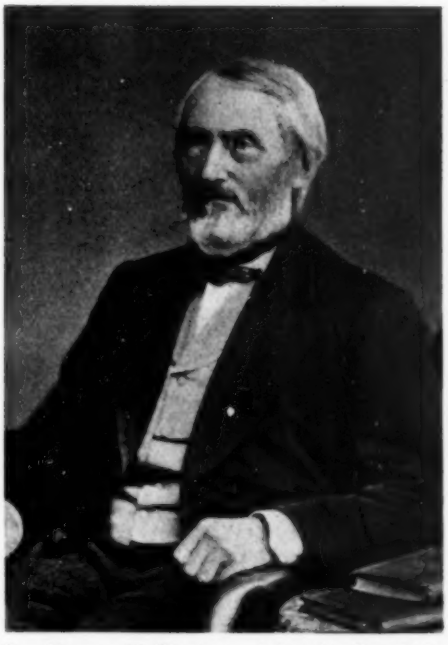
* When this article went to the printer Bela Hubbard was dangerously ill, and his death occurred on June 13th. Recent letters from him have furnished some of the most interesting of these reminiscences.

held in Philadelphia, and on September 20, 1848, the original organization was changed to the "American Association for the Advancement of Science."

William B. Rogers presided at the dissolution of the Association of Geologists and Naturalists, and yielded the chair to William C. Redfield, the first President of the American Association for the Advancement of Science.

Prof. Redfield was a resident of New York city and a pioneer in the study of meteorology. He published a theory of storms which became well known and was strenuously controverted by Espy, so that the storm controversy was a conspicuous feature of scientific annals. Prof. Redfield's influence had much to do with the establishment of the Weather Bureau of the United States.

The association began with a membership of four hundred and sixty-one, which increased to a thousand and four in 1854 at the Washington meeting under the presidency of James D. Dana. This was high-water mark for the first thirty years of its existence. In 1850 and 1851 two meetings were held in each year, but none in 1852. Thereafter annual meetings were held till 1860. The presidents during this period, besides those already mentioned, were Joseph Henry, Alexander D. Bache, Louis Agassiz, Benjamin Peirce, John Torrey, James Hall, Stephen Alexander, and Isaac Lea.

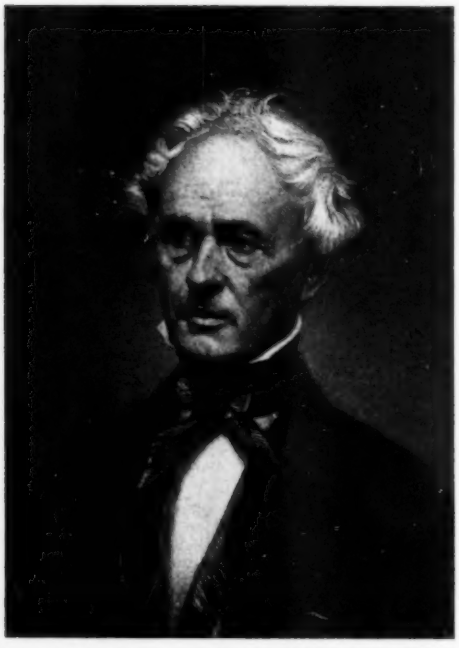


DR. MARTIN H. BOYÉ, surviving founder of the Association of American Geologists and of the A. A. A. S.

Of this illustrious roll, James Hall alone survives. He presided at the second Albany meeting in 1856, when the old Dudley Observatory was dedicated, the largest, most important, and most representative scientific meeting ever held in America before the war. The glowing eloquence of Edward Everett in his dedicatory oration, delivered in a tent erected for the occasion in the historic park of the Albany Academy, still haunts the memory of the writer, who was then a pupil in that academy. Meetings of the association during the *ante-bellum* period were held as far east as Cambridge and as far west as Cincinnati, while Montreal and Charles-

ton, S. C., were the extremes north and south. New Haven, Cleveland, Washington, Providence, Baltimore, Springfield, and Newport were also visited.

The association adjourned at Newport in 1860, intending to meet at Nashville in 1861, but the war intervened, and the meeting could not be held; and there were no other meetings till 1866, when seventy-nine members met at Buffalo and reorganized the association. Since that time Buffalo has been a sort of Mecca, and every tenth year we reassemble there. The president at the first Buffalo meeting was Frederick A. P. Barnard, President of Columbia College. At the second Buffalo meeting William B. Rogers, already mentioned as the last President of the American Association of Geologists and Naturalists, presided. Edward S. Morse was president at the meeting in 1886. Edward D. Cope, of Philadelphia, has been elected president for the meeting of this year.



WILLIAM C. REDFIELD, first President A. A. A. S., Philadelphia, 1848.

Since the reorganization at Buffalo the association has expanded and developed in many ways. At the Hartford meeting in 1874 it was incorporated under the laws of the State of Massachusetts, and it has its headquarters and museum at Salem. At the Hartford meeting also provision was made to apply the designation of "fellows" to such of the members as were devoted to science or had advanced the cause of science, and one hundred and fifty-seven members were thus constituted fellows, of whom about one half still survive. Since that time the number of fellows increased year by year, till in 1893 there were seven hundred and ninety-six, while the membership of the association reached its maximum of two thousand and fifty-four in 1891. The largest attendance of members was at Boston in 1880, when nine hundred and ninety-seven were registered. At Philadelphia in 1884 the registration reached twelve hundred and sixty-one, but nearly three hundred of this number were visitors from the British Association, which

had just held a meeting at Montreal, and from other foreign bodies.

The division of the association into sections began at the Detroit meeting in 1875, when two sections were formed: Section A, Mathematics, Physics, and Chemistry; and Section B, Natural History. At the second Montreal meeting in 1882 a much more extended subdivision was made, the following having been established: Section A, Mathematics and Astronomy; B, Physics; C, Chemistry; D, Mechanical Science and Engineering; E, Geology and Geography; F, Biology; G, Microscopy; H, Anthropology; I, Economic Science and Statistics. In 1886 Section G was united with Section F, and in 1893 Section F was divided into Section F, Zoölogy, and Section G, Botany. The name of Section I was changed in 1895 to Social and Economic Science.

A notable feature of recent meetings of the association has been the large number of affiliated societies which meet at about the same time. The first of these was the Society for the Promotion of Agricultural Science, which was organized at Boston in 1880. Others were added from time to time, till at Brooklyn, in 1894, there were nine, viz., the Society for the Promotion of Agricultural Science, Society for the Promotion of Engineering Education, American Mathematical Society, American Chemical Society, American Microscopical Society, American Forestry Association, Association of Economic Entomologists, Association of State Weather Services, and American Geological Society, besides the Botanical and Entomological Clubs of the association. At Brooklyn also was organized the American Botanical Association. It has been doubted whether these numerous societies do not detract from the interest in the main association, and action was taken at the second Springfield meeting in 1895 in the direction of making them business meetings rather than meetings for the reading of papers.

FREDERICK A. P. BARNARD, President A. A. A. S., first Buffalo meeting, 1866.

Meetings have been held since the war in Maine, Vermont,

Massachusetts (three), Connecticut, New York (eight), Pennsylvania, District of Columbia, Ohio (two), Indiana (two), Illinois, Michigan (two), Wisconsin, Minnesota, Iowa, Missouri, Tennessee, and Canada (two). The list of past presidents includes, besides those previously mentioned, John S. Newberry, Benjamin A. Gould, John W. Foster, T. Sterry Hunt, Asa Gray, J. Lawrence Smith, Joseph Lovering, John L. Le Conte, Julius E. Hilgard, Simon Newcomb, Othniel C. Marsh, George F. Barker, Lewis H. Morgan, George J. Brush, J. William Dawson, Charles A. Young, John P. Leslie, Huber A. Newton, Samuel P. Langley, John W. Powell, Thomas C. Mendenhall, George L. Goodale, Albert B. Prescott, Joseph Le Conte, William Harkness, Daniel G. Brinton, and Edward W. Morley.

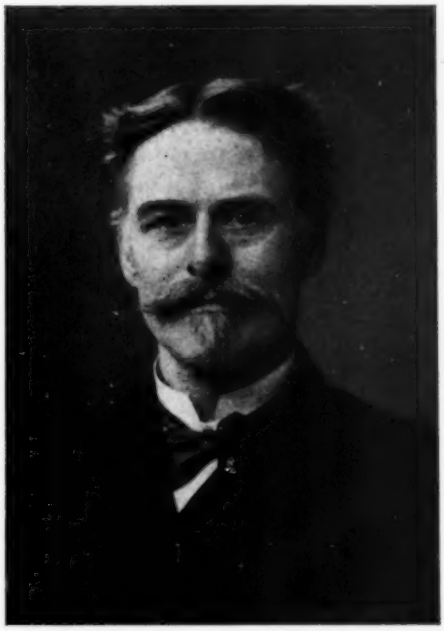
WILLIAM B. ROGERS, President A. A. A. S., second Buffalo meeting, 1876.

EDWARD S. MORSE, President A. A. A. S., third Buffalo meeting, 1886.

The president elect, Edward Drinker Cope, was born of Quaker ancestry at Philadelphia, July 28, 1840. He was educated at the Westtown Academy and the University of Pennsylvania, and afterward studied comparative anatomy in the Academy of Sciences, Philadelphia, and the Smithsonian Institution at Washington, and later in Europe. He was Professor of Natural Sciences at Haverford College from 1864 till 1867, resigning in the latter year because of ill health. Later he was paleontologist of the United States Geological Survey, serving first in the Territories west of the one hundredth meridian. His discoveries were numerous

and important, including a thousand or more extinct and nearly or quite as many living vertebrates.

Prof. Cope was for many years secretary and curator of the Academy of Natural Sciences of Philadelphia, and chief of the department of organic material of the permanent exhibition of that city. He was elected a member of the National Academy of Sciences in 1872. He has published numerous works of a scientific nature, including several hundred papers, and dozens of larger works. He has for many years edited the American Naturalist.



EDWARD D. COPE, President elect A. A. A. S., fourth Buffalo meeting, 1896.

The fourth Buffalo meeting is to be held in the week beginning August 24th. Mayor Jewett is president of the local committee, and Eben P. Dorr is local secretary. Prof. Frederick W. Putnam remains permanent secretary, having filled that office during the greater part of the existence of the association.

The association assembles this year at Buffalo at an epoch marked by wonderful advances in applied science. The harnessing of Niagara, and the utilization of that immense power for electrical and manufacturing purposes, will furnish the most impressive object lesson which has ever been presented to the association in the whole forty-eight years of its existence. The study of Niagara has been an absorbing feature of all the Buffalo meetings. Heretofore it was the geology of that stupendous gorge which appealed most strongly to the attention of visitors. Now the new and diversified uses of the energy set free by the cataract will invest the visit to Niagara with new importance and significance.

PROF. G. STANLEY HALL expressed the opinion, at the recent meeting of the American Antiquarian Society, that the difficulties of the American people with the Indians had arisen from trying to educate them along a line with which they have no sympathy, and with which they can not assimilate, instead of encouraging them in improving their own scheme of life.

"SPIRIT" WRITING AND "SPEAKING WITH TONGUES."

By Prof. WILLIAM ROMAINE NEWBOLD.

THE word "automatism" not only designates a group of phenomena but also connotes a theory as to their origin, and this theory rests upon the popular conception of the relation of "soul" and body. The soul, according to it, is an entity of a peculiar kind, entirely distinct from and independent of the body. The body is a material machine, and does not essentially differ from the machines made by man. The relation between soul and body is one of reciprocal action and interaction. The body is the medium through which material realities external to it are communicated to the soul under the guise of the sensations and conceptions of consciousness; it possesses also the capacity of executing certain movements—as, for example, reflexes—without the concurrence of the soul. But the more complex movements of the body, especially those which adjust it to a constantly shifting environment and those which serve as the exponents of mental life, can not be executed without the co-operation of the soul. Occasionally these normal relations appear to be disturbed. Movements take place of the kind usually ascribed to the activity of the soul, and that soul disavows them. Sensations and perceptions enter into the range of consciousness for which no external reality can be found, and thoughts strangely unlike those proper to the thinker troop through his mind and force themselves upon his unwilling attention. These phenomena are ascribed to the agency of the body as distinguished from that of the soul on the one hand, and that of the material world on the other. The body is a machine out of gear; it is no longer controlled by the indwelling soul, and is constantly executing movements on its own account and forcing upon the soul sensations, perceptions, and ideas which stand for no realities save that of the disordered mechanism which produces them. Thus the three chief forms of automatism are: the automatism of movement, of sensation, and of thought or ideation. While I shall use the word automatism and its derivatives, I do not, of course, wish to be understood as subscribing to the theory which it connotes.

Automatic movements may be of any and all kinds. The simplest are those of which the actor is thinking at the time although himself unaware that his thought is passing over into movement. To this type belong the marvels of the pendulum which swings above a reflecting surface only, of the divining rod, of most forms of table-turning, of "thought transference" as practiced by Bishop and Cumberland, *et id genus omne*. Space forbids my entering

into the discussion of these relatively familiar cases, and I shall turn at once to the more complex types.

Automatic writing is an exceedingly common phenomenon. It took its rise from table-turning. Ordinary tables being found in many cases too heavy for the "spirits" to lift, tiny three-legged tables were made for the purpose and termed "planchettes." Later the device was hit upon of attaching a pencil to one leg and placing a sheet of paper beneath to record the movements of the leg. This is our modern planchette. Two or three persons then put their hands on the instrument and wait to see "what planchette will say." Many automatists need no planchette. It is enough for them to take a pencil in hand and sit quietly with the hand on a sheet of paper. After the lapse of a variable period of time the hand will stiffen, twist, and fall to writing quite of its own accord. Of these methods planchette is the more likely to be successful. In the first place, the chances of finding an automatist among two or three people is obviously greater than in the case of one; furthermore, since all expect planchette to move, the slightest tendency to automatism on the part of any one is likely to be magnified by the unconscious co-operation of the others, and is less likely to be checked by the writer himself, since each ascribes the movement to any one but himself.

The writing produced by either of these methods may be regarded as belonging to one of two main types: 1. That which, although involuntary, is dependent upon the co-operation of the subject's consciousness. 2. That which is produced without the co-operation of the subject's consciousness. The latter, again, may be either intelligible or in "unknown tongues."

Intelligible automatic writing may be produced without the co-operation of the subject's consciousness, either when that consciousness is apparently unimpaired, or when the patient is in a trance state. The latter I need not now discuss, as it belongs to the same category as dreams, but the former calls for some comment.

There are two methods of proving that the automatic messages did not emanate from the subject's upper consciousness. In the first place, it is sometimes found that they become the more clear and copious the more effectually the upper consciousness of the subject is distracted from the writing. Miss G——, for example, whom I studied with some care, always did her best automatic writing when busily engaged in conversation or in reading aloud. I concealed her hand from her eyes, and it was but now and then that she would decipher a word by the sense of touch and movement as it was written. But the messages she wrote were always trivial, silly, and often self-contradictory.

In the second place, the content of the writing may be of such

a character that we can scarcely ascribe it to the subject's consciousness. In hysterical patients, for example, the upper consciousness, or at least the consciousness which talks, is often anæsthetic to one or more sensory stimuli, yet the automatic writing betrays consciousness of the lost sensations. Prof. James, of Harvard, has noted the same phenomenon in an apparently normal patient.* "The planchette began by illegible scrawling. After ten minutes I pricked the back of the right hand several times with a pin; no indications of feeling. Two pricks on the *left* hand were followed by withdrawal, and the question, 'What did you do that for?' to which I replied, 'To find out whether you are going to sleep.' The first legible words which were written after this were, '*You hurt me.*' A pencil in the right hand was then tried instead of the planchette. Here again the first legible words were, '*No use* (?) *in trying to spel when you hurt me so.*' Next, '*It's no use trying to stop me writing by pricking.*' These writings were deciphered aloud in the hearing of S——, who seemed slow to connect them with the two pin-pricks on his left hand, which alone he had felt. . . . I pricked the right wrist and fingers several times again quite severely, with no sign of reaction on S——'s part. After an interval, however, the pencil wrote: '*Don't you prick me any more.*' . . . S—— laughed, having been conscious only of the pricks on his left hand, and said, 'It's working those two pin-pricks for all they are worth.'" Yet the hand was not anæsthetic when directly tested.

Sometimes the automatic message is potentially known indeed to the upper consciousness, but not at the time present to it. Take, for example, one of Mr. Gurney's experiences:†

"In 1870 I watched and took part in a good deal of planchette writing, but not with results or under conditions that afforded proof of any separate intelligence. However, I was sufficiently struck with what occurred to broach the subject to a hard-headed mathematical friend, who expressed complete incredulity as to the possibility of obtaining rational writing except through the conscious operation of some person in contact with the instrument. After a long argument he at last agreed to make a trial. I had not really the faintest hope of success, and he was committed to the position that success was impossible. We sat for some minutes with a hand of each upon the planchette, and asked that it should write some line of Shakespeare. It began by seesawing and producing a great deal of formless scribble; but then there seemed to be more method in the movements, and a line of hieroglyphics appeared. It took us some time to make it out, the

* Proceedings of the American Society for Psychical Research, vol. i, p. 549.

† Proceedings of the Society for Psychical Research, vol. iv, p. 301, note.

writing being illegible just to that degree which at first baffles the reader, but which afterward leaves no more doubt as to its having been correctly deciphered than if it were print. And there the line indubitably stood: '*A little more than kin and less than kind.*' Now, as neither of us had been thinking of this line, or of any line (for we had been wholly occupied with the straggling movements of the instrument), the result, though not demonstrative, is at any rate strongly suggestive of a true underground psychosis."

At other times the information conveyed is at once true and quite unknown to the subject. Some of these cases are undoubtedly due to the automatic reproduction of memories which can not at the time be recalled—a common phenomenon in all forms of automatism. Thus, in the case of B——, to which I shall refer at greater length hereafter, it was stated that a man named Parker Howard had lived at a certain number on South Sixteenth Street, Philadelphia. Upon going to the house, I found that a man named Howard—not Parker Howard, however—had lived there some time, but had moved away about two months before. Moreover, the whole Howard incident proved to be mythical; no such person as Parker Howard ever existed. But B—— told me that after his hand had mentioned the name, and before the address was given, he stepped into a shop and looked through a directory for the name. Probably, as he glanced over the list of Howards, his eye had fallen upon the address which his hand afterward wrote, but he had no recollection of it.

Many other cases are certainly due to accidental coincidence. B——, for example, wrote long accounts of events happening at a distance from him, which were afterward found to be in the main correct; but that this was a mere matter of chance was abundantly proved to B——'s own satisfaction. The chances of coincidence are much increased by the extremely illegible character of much of the script, which leaves wide room for "interpretation." I can not but suspect that the "anagrams" sometimes written automatically often owe their existence to this kind of "interpretation." Yet, after making all allowances for coincidence and forgotten memories, nearly all investigators admit that there remains a residuum which can not plausibly be explained by any accepted theory. I can not discuss this residuum here; it is enough to point to its existence, with the caution that no theory can be regarded as final unless it can explain all the facts.

The importance of this material from a psychological point of view can not be overestimated. If the man's hand can write messages without the co-operation of the man's consciousness, we are forced upon the one horn or the other of a very perplexing dilemma. Either these utterances stand for no consciousness at

all, merely recording certain physiological processes, or else they indicate the existence of mentation which does not belong to any recognized human being. The first would seem to deny the doctrine of parallelism, according to which physiological processes of the degree of complexity requisite to the production of writing necessarily generate mental states, and this would lead us toward the old theory of the soul, or something like it. The second would compel the assumption either of personalities distinct from that of the subject, which is the theory of possession, or of segregated mental states. The latter is the theory which I am developing in these pages, and although I am far from satisfied with it, it is more in line with our present scientific conceptions than others, and accounts for some of the facts fairly well.

But this dilemma presents itself only when it can be shown that the subject's upper consciousness has nothing to do with the

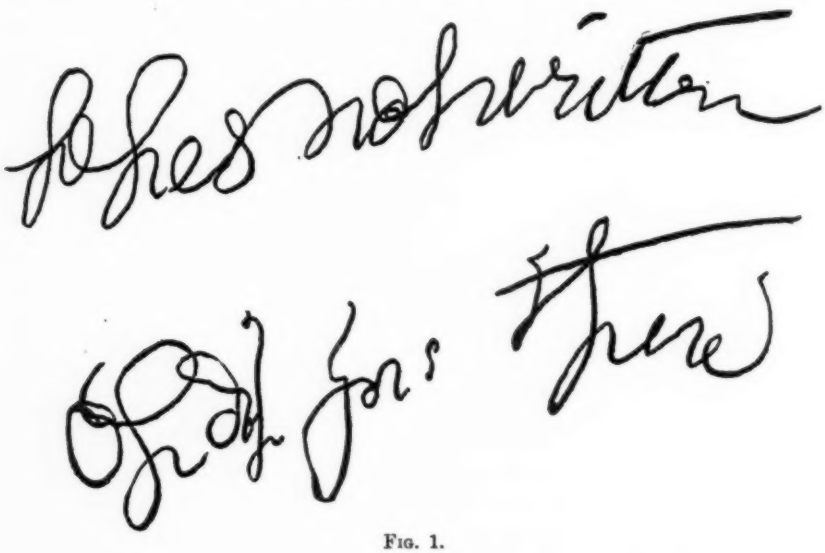


FIG. 1.

production of the writing. I am convinced that experimenters do not pay sufficient attention to this point, and consequently much of the recorded material is to my mind of little significance. As my space is limited, I wish to lay especial stress upon this aspect of the problem.

A few years ago I had the opportunity of studying at leisure a remarkably good case of automatism. The subject, whom I shall call B——, was a man of intelligence and education, with whom I had long been on terms of intimacy, and of whose good faith I can therefore speak with some confidence. The writing was at first a mere scrawl, accompanied by quite violent twisting of the arm; little by little it became intelligible, wrote "Yes"

and "No," took to printing in large capitals, and finally fell into an easy script almost identical with B——'s normal hand. The communications always professed to emanate from spirits, and, on the

FIG. 2.

whole, fulfilled in phraseology, style of script, etc., B——'s notions as to what the alleged spirit ought to say and write. One "spirit," for example, was R——, to whom writing had been ascribed by another automatist whom B—— had seen, and his writing, as executed by B——'s hand (Fig. 1), was clearly a rough imitation of the original (Fig. 2). Fig. 3 represents the script of another mythical spirit. Yet another alleged communicator was the late Stainton Moses; Fig. 4 is his signature as written by B——'s hand; Fig. 5 is a facsimile of his actual signature, which B—— had seen. I think there is here also an attempt at imitation, although a very bad one. Another "communicator" began as shown in Fig. 6; he then announced that he was born in 1629, and died in 1685. Now, B—— knows a little about seventeenth-century script, and he instantly saw that this did not resemble it. Scarcely had he noticed the discrepancy when his hand began writ-

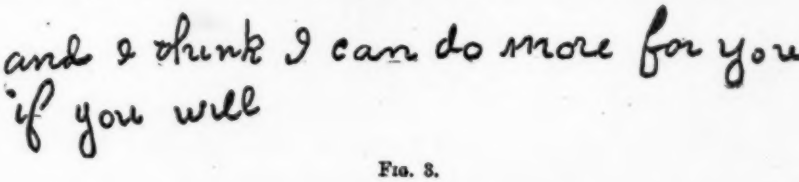
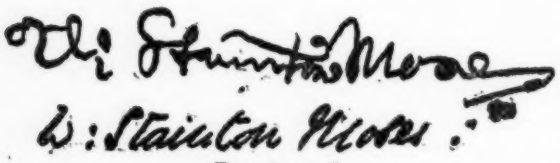


FIG. 3.

ing the script figured as No. 7, which is not unlike that then in use. B—— thought at the time that he could not write this hand voluntarily without taking pains, but upon attempting it he

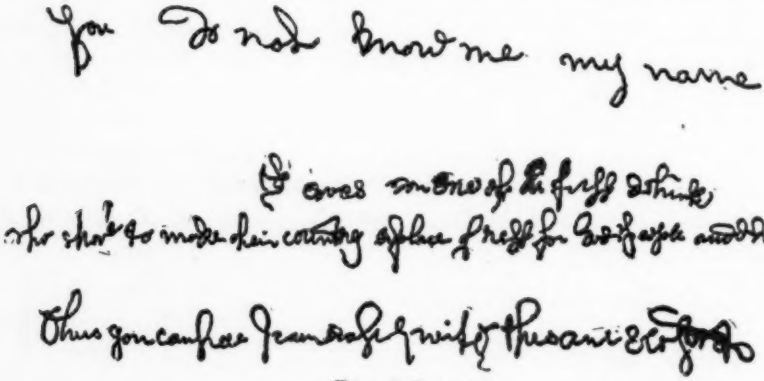
found that he could do it voluntarily as well as automatically (Fig. 8).

It was easy enough to prove that these communications had nothing to do with spirits. B—— satisfied himself upon that point in a very short time. But we kept on experimenting, to determine whether they were of subconscious origin or not. To B—— himself they felt strangely external. To quote his own words:



FIGS. 4 AND 5.

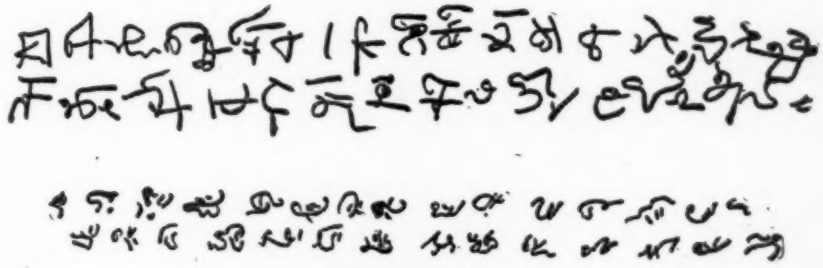
"When I wish to write automatically I take a pencil and place my hand upon a sheet of paper. After the lapse of a few minutes I feel a tingling sensation in my arm and fingers; this is followed by a stiffening of the arm and by convulsive movements. After scrawling for a while, it will make a mark which suggests to me the beginning of a letter, and usually the letter will be clearly written almost before the thought enters my mind. It is then followed by some word beginning with that letter, and that by other words, constituting a 'communication' from some 'spirit.' The writing then proceeds quite rapidly. It seems to me that I read it as it is written; sometimes I apparently anticipate the writing, but quite often it does not proceed in accordance with my anticipation. Sometimes the writer seems to be at a loss how to complete his sentence, and begins again. At other times an illegible combination of signs will be repeatedly written, until



FIGS. 6, 7, AND 8.

finally a word is evolved, and this appears to be what the writer had in mind at the outset. I am now satisfied, however, that there is never any foresight; my hand simply develops the illegible scrawl into the word which I think it most resembles, thus ful-

filling my expectations. This is curiously shown in the emotion it displays. It will twist violently about, pound on the table, bruise my fingers, break my pencils, and show every sign of the greatest excitement, while I, the spectator, survey it with the coolest and most skeptical curiosity. But it will do this only when such emotion seems to me appropriate, just as the persons I see in my dreams may manifest an emotion which I do not share. My hand sometimes abuses me, especially for my skepticism, and sometimes reproves my faults in a very embarrassing manner. It has frequently urged me, upon very plausible grounds, to do things which I would not dream of doing. In every case save one the reasons given were untrue, and in that one I am satisfied the coincidence was due to chance. On two occasions my hand wrote a short stanza with little hesitation. I have never done such a thing myself, but the verses were so incoherent and so atrocious



FIGS. 9 AND 10.

that I have no doubt they were developed successively, each being based upon the suggestions of the preceding in the manner above described."

I can see no reason for ascribing B——'s writing to subconscious states. It was never intelligible unless B—— allowed himself to "read" it. If he persistently distracted his attention or refused to wonder what his hand was trying to write, it would make marks resembling writing, but never "wrote sense." It was highly suggestible. If he wondered why it did not print, it would instantly try to print; and if, while trying to print, he refused to wonder what it said, it produced strange characters resembling some unknown language. Fig. 9 is a facsimile of a few of these; they were written as rapidly as the hand could fly. Fig. 10 is a facsimile of some writing executed by a Dr. Mayhew, October 5, 1853 (*Neueste spiritualistische Mittheilungen*, Berlin, 1862), and purports to be an account written by a spirit from the planet Saturn of the Saturnian mythology. In this case the spirit kindly wrote a "translation" giving the general sense, and in B——'s case, had he for a moment believed that the writing was intelligible to the writer, I have no doubt that a "translation"

would have been as promptly forthcoming. This automatic production of mysterious characters is not uncommon. Prof. James, of Harvard, has examined many cases, but neither he nor any one else has ever, so far as I know, found any that could be deciphered.

Thus, the intelligibility of B——'s script is fully accounted for; but its automatic character remains more or less of a puzzle. I am inclined to regard it as due to the spontaneous "running" of some parts of the nervous mechanism which have nothing to do with consciousness. Precisely *what* parts we can not say, but if we suppose that consciousness accompanies cortical processes only, we may also suppose that they are to be found in the reenforcing and co-ordinating mechanism of the great basal ganglia. If so, this case might be regarded as strictly automatic—i. e., as due to mechanical causes only.*

I do not believe that all cases of automatic writing can be explained in this way; but I am convinced that experimenters do not take sufficient pains to eliminate the action of the subject's consciousness. They seem to think that where the sense of voluntary effort is lacking the subject's consciousness can not interfere.

For the first carefully observed and reported case of automatic speech we are indebted to Prof. James, of Harvard. His paper, together with an account written by the subject, will shortly appear in the Proceedings of the Society for Psychical Research. I have not yet seen it, but he has kindly allowed me to make an independent study of the case for myself and to make use of it in this connection. The subject, whom I shall call Mr. Le Baron, is an Englishman thirty-eight years of age, is a man of education, has written a novel, a volume of poems, and a treatise on metaphysics, and is a reporter for a daily paper. In the summer of 1894 he fell in with a group of persons interested in occultism, and his association with them appears to have brought to the surface tendencies to automatism which had already manifested themselves sporadically. Of this association he thus speaks: "Before and almost immediately preceding this 'speaking with tongues' my nature had undergone a most remarkable emotional upheaval, which terminated in a mild form of ecstasy. Credulity and expectation are twin brothers, and my credulity was first aroused by the earnest narration of divers 'spiritualistic' experiences by a cultured lady of beautiful character, fine presence, and the noblest of philanthropic intuitions. A number of persons associated with this lady in her work secretly believed themselves

* Some further details about this case can be found in my paper, The Experimental Induction of Automatic Processes, in the Psychological Review, July, 1895.

the elected 'spiritual' vanguard of humanity. Not to understand these facts is not to understand the potent factors giving rise to the phenomenon."

In some way or other this group of occultists, whose leader I shall call Miss J——, got the notion that Mr. Le Baron was the reincarnated spirit of the Pharaoh of the Exodus. Miss X——'s mother, they thought, had loved that king in a previous incarnation, and was still watching over his transmigrations. The time was now ripe for him to be forgiven his sins and to be brought to the light, and she was to make of him an instrument for a fuller revelation of God to humanity. They impressed this delusion upon Mr. Le Baron with all the energy of conviction. "Unless it be borne in mind," he says, "that the air was full of a greedy expectancy concerning the appearance of a reincarnated prophet, no solution of this problem is possible." His common sense protested, and he would not, perhaps, have been much affected had not a traitor within the camp presented itself in the form of his own highly suggestible and excitable nervous system, which caught the ideas with which he was surrounded and reflected them to the confusion of his understanding. This automatism first appeared in the form of writing. "My credulity was as profoundly sincere as it was pitifully pathetic. It was aroused by the narration of the purported history of a finger ring supposed to have been worn ages ago by a vestal virgin in one of the ancient temples of Egypt. Miss J—— believed she wore the ring in those days, and was herself the vestal virgin. On one occasion, in August, 1894, she asked me to place the ring on my finger and attempt automatic writing. I did so. Violent jerks followed, leading to scribbling upon the sheets of paper which were laid before me. This she attributed to spirits, and the placing on of the ring was in some way a sign to call them into activity. The 'invisible brotherhood' were subsequently declared to be *en rapport* with me, and in the exact ratio of my credulity concerning this assertion did this singular, insentient, emotional mechanism co-operate with the sensations of my common consciousness, and at times assume intelligible proportions."

The circumstances under which automatic speech appeared he was not able to fix with precision. He recollected two occasions, but was not able to say which came first. On one, he was at a *séance* at Miss J——'s house. He was asked to lie upon a couch upon which Mrs. J—— had lain during her last illness, and to look at a brilliantly illuminated portrait of her. In a short time he was seized with a convulsive paroxysm of the head and shoulders; this was followed by a flow of automatic speech purporting to emanate from the spirit of Mrs. J——, and fully confirming his friends' notions. Upon another occasion he was in a pine wood

at night with them. Certain of the ladies professed to see signs and portents in the skies, and he had a similar convulsive attack followed by speech. This began with the words, "O my people! O my people!" and was of a semiprophetic character. As an illustration of the sort of confirmation thus given, I may quote a passage, spoken automatically September 6, 1894, and purporting to come from Mrs. J——: "I am the mother of the Evangel. There are several things which must be done. S—— (Miss J——) must go to the house of the man she got the things from on the day of the coming of the man from the other side of the water. Also tell her that she must tell the man that the work is to be of the kind he said he would help on. And tell her that I say that she must go to him and say that I am the one that sent her to him; and also say that the whole world is now ready for the coming of the day when the coming of the truth shall enlarge the whole possibilities of the race. You may also say that I said that he was the man that the whole of the thing on the day of the fate had to be turned to. Say that I am now with the man whom I shall go with in the spirit to direct him," etc.

Mr. Le Baron had heard of "speaking with tongues," and, believing as he did in transmigration, naturally inferred that he "must have some dead languages lurking away somewhere in the nooks and crannies of his much-experienced soul." Hence, not long after the invasion, his utterances assumed this character. They were poured forth very rapidly in deep, harsh, loud tones, coming apparently from the abdomen; often, he told me, "it seemed as if the malignity of a city were concentrated into a word," and many persons found the sound most startling. In an affidavit made February 2, 1895, he swore that "since the first day of September, 1894, he has experienced an automatic flow of foreign speech the meaning of which he does not understand when he utters it; that he is not a professed medium, and makes no claim to any supernatural or supernormal claims for the same; that he can utter by the command of his will this automatic flow of foreign consonantal and vowel combinations at any place and time to any length; and that the aforesaid automatic flow often assumes other linguistic forms than the following."

One or two illustrations of the "unknown tongues," in prose and verse, must suffice: "Shurumo te mote Cimbale. Ilunu teme tele telunu. Onstomo te ongorolo. Sinkete ontomo. Isa bulu, bulu, bulu. Ecemete compo tete. Olu mete compo. Lete me lu. Sine mete compote. Este mute, pute. Ompe rete keta. Onseling eme ombo lu mu. Outeme mo, mo, mo. Ebedebede tinketo. Imbe, Imbe, Imbe."

"Ede pelute kondo nadode
Igla tepete compto pele

Impe odode inguru lalele
Omdo resene okoro pododo
Igme odkondo nefulu kelala
Nene pokonto ce folodelu
Impete la la feme olele
Igdepe kindo raog japate
Relepo oddo og cene lumano."

After the utterance in a "tongue" a "translation" was usually given in the same way, and the "translation" of the above poem, although somewhat incoherent, is of a distinctly higher order than most of the prose utterances. Witness one stanza:

"The coming of man from the roar of the ages
Has been like the seas in the breath of the storm;
His heart has been torn and his soul has been riven,
His joy has been short and his curse has been long.
But the bow of my promise still spreads in the heavens;
I have not destroyed the great sign of my love.
I stand at the door of the ark of creation,
And take in thy world like a storm-beaten dove,
And press to my bosom the world that I love."

Mr. Le Baron has shown traces of sensory automatism, but very seldom. Once, in a sleeper returning from Chicago, he was awakened by a voice in his ears saying, "Enthusiasm shall fill the hearts of the multitude in the place of the hours of the day." He has also seen flashes of light.

As an illustration of automatic "prophecy" I may quote the following: "I have heard the wail of the dying and I have heard the wail of the man whose heart was broken. I have heard the voice of mirth and I have heard the voice of woe. I have heard the voice of him who is darkness and I have heard the voice of him who is light. I have heard the roar of the ocean and I have heard the song of the bird. I have heard the triumph of peace and I have heard the triumph of woe. I have heard the tears of the nations as they fell and I have heard the songs of the nations as they rose. I have heard the roar of cities and I have heard the music of the woodlands. I have heard the roar of the death of the man who was slain in battle and I have heard the shout of the victor. I have heard the new word and I have heard the old word," etc.

Mr. Le Baron never publicly admitted any belief in the veridical character of these utterances. As he says himself: "All this involved such an unscientific view of things, and was, moreover, so horribly egotistic and full of 'gall,' impudence, and assumption, that I said nothing about it save to the few who had been throwing fuel upon the fire of my reincarnation conceptions and who were ready to believe anything in support of the hypothesis."

Yet he was much impressed, as he frankly owns: "I, for the time being and for months afterward, assented to the statement of my subliminal that my soul had pre-existed; I also believed that it knew when and where it had pre-existed. When it therefore stated that I had been sent through the fires of three thousand years of awful transmigration because, as Rameses or Sesostris, my way had not been 'the way of the Lord,' I either had to assent to the inference that my subliminal was a liar, or that it told the truth, or that it was mistaken. As it insisted upon pouring into my upper consciousness the loftiest of spiritual advice, I concluded that, if it was such a pure teacher of love and justice, it would make no mistake *knowingly* about a matter of history." Yet he never lost sight of the fundamental point—that, without verification, his automatic utterances were worthless, and he deliberately set himself the task of verifying or disproving them. He sought the advice of linguists and toiled through many a grammar and lexicon of little known languages with a purely negative result. The languages proved to be nothing more than meaningless combinations of sounds, and the supposed lofty communications from the Almighty were found to be the scarcely more intelligent reflection of the ideas with which the air was surcharged. As he himself jokingly phrased it in conversation, "I was like a cat chasing her own tail." I can not do better, in concluding my account of this case, than quote Mr. Myers's comment upon it:* "He had the good fortune to meet with a wise and gentle adviser,† and the phenomenon which, if differently treated, might have led on to the delusion of many, and perhaps to the insanity of one, became to the one a harmless experience, and to the world an acquisition of interesting psychological truth."

The only other outbreak of automatic speech of which any considerable details have been preserved was that which took place among the followers of the Rev. Edward Irving at the close of the first third of the present century. I have not been able to get access to all the extant information about this outbreak, but there can be little doubt that it was precisely analogous to Mr. Le Baron's experience. The "unknown tongues" were usually followed by a "translation," and all witnesses describe them as uttered in strange and unnatural tones. One witness speaks of them as "bursting forth, and that from the lips of a woman, with an astonishing and terrible crash." Says another, "The utterance was so loud that I put my handkerchief to my mouth to stop the sound, that I might not alarm the house." Another: "There was indeed in the strange, unearthly sound an extraor-

* Journal of the Society for Psychical Research, vol. vii, p. 250.

† Mr. Myers has Prof. James in mind.

dinary power of voice, enough to appall the heart of the most stout-hearted." Of its subjective side we have a vivid description from the pen of Robert Baxter, who was for a while one of Irving's leading prophets, but afterward, finding that the prophecies which his mouth uttered did not come true, he ascribed them to "lying spirits." He thus describes his own original experience:

"After one or two brethren had read and prayed, Mr. T—— was made to speak two or three words very distinctly and with an energy and depth of tone which seemed to me extraordinary, and fell upon me as a supernatural utterance which I ascribed to the power of God. The words were in a tongue I did not understand. In a few minutes Miss E. C—— broke out in an utterance in English which, as to matter and manner and the influence it had upon me, I at once bowed to as the utterance of the Spirit of God. Those who have heard the powerful and commanding utterance need no description; but they who have not, may conceive what an unnatural and unaccustomed tone of voice, an intense and riveting power of expression, with the declaration of a cutting rebuke to all who were present, and applicable to my own state of mind in particular, would effect upon me and upon others who were come together expecting to hear the voice of the Spirit of God. In the midst of the feeling of awe and reverence which this produced I was myself seized upon by the power, and in much struggling against it was made to cry out and myself to give forth a confession of my own sin in the matter for which we were rebuked. . . . I was overwhelmed by this occurrence. . . . There was in me at the time of the utterance very great excitement, and yet I was distinctly conscious of a power acting upon me beyond the mere power of excitement. So distinct was the power from the excitement that in all my trouble and doubt about it I never could attribute the whole to excitement. . . . In the utterances of the power which subsequently occurred many were accompanied by the flashing in of conviction upon my mind, like lightning rooting itself in the earth; while other utterances, not being so accompanied, only acted in the way of an authoritative communication." At another time he was reading the Bible. "As I read, the power came upon me and I was made to read in the power, my voice raised far beyond its natural pitch, and with constrained repetition of parts and with the same inward uplifting which at the presence of the power I had always before experienced."

So far as I know, there exists no written record of the "tongues" spoken by the Irvingites, but the few specimens of their "prophecies" which I have seen present identically the same characteristics as those found in Mr. Le Baron's utterances

—the same paucity of ideas, the same tendency to hover about one word or phrase with senseless repetitions. One illustration will serve, *ex uno discite omnia:*

"Ah, will ye despise, will ye despise the blood of Jesus? Will ye pass by the cross, the cross of Jesus? Oh! oh! oh! will ye crucify the Lord of glory? Will ye put him to an open shame? He died, he died, he died for you. He died for you. Believe ye, believe ye the Lamb of God. Oh, he was slain, he was slain, and he hath redeemed you; he hath redeemed you; he hath redeemed you with his blood! Oh, the blood, the blood, the blood that speaketh better things than the blood of Abel—which crieth mercy for you now, mercy for you now! Despise not his love, despise not his love, despise not his love!

"Oh, grieve him not! Oh, grieve not your Father! Rest in his love. Oh, rejoice in your Father's love! Oh, rejoice in the love of Jesus, in the love of Jesus, in the love of Jesus, for it passeth knowledge! Oh, the length! oh, the breadth! oh, the height! oh, the depth, of the love of Jesus! Oh, it passeth knowledge! Oh, rejoice in the love of Jesus! O sinner, for what, for what—what, O sinner, what can separate, can separate, can separate from the love of Jesus?" etc.

Mr. Le Baron's "tongues" are constructed upon the same general principle, one phonetic element appearing to serve as the basis or core for a long series of syllables. I believe all these cases to be analogous to that of my friend B——, and I see no reason for ascribing them to subconscious activities of any kind.

THE GENIUS AND HIS ENVIRONMENT.

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III.

WITH this outcome, we may return to the genius. And the first requirement is that we state the social man in the fewest terms, in order that we may then judge the genius with reference to the sane social man, the normal *socius*. What he is we have seen. He is a person *who learns to judge by the judgments of society*. What, then, shall we say of the genius from this point of view? Can the hero-worshiper be right in saying that the genius teaches society to judge; or shall we say that the genius, like other men, must learn to judge by the judgments of society?

The most fruitful point of view is, no doubt, that which considers the genius a variation. And unless we do this it is evidently impossible to get any theory which will bring him into

our general scheme. But how great a variation? and in what directions?—these are the questions. The great variations found in the criminal by heredity, the insane, the idiotic, etc., we have found excluded from society; so we may well ask why the genius is not excluded also. If our determination of the limits within which society decides who is to be excluded is correct, then the genius must come within these limits. He can not escape them and live socially.

The directions in which the genius actually varies from the average man are evident as a matter of fact. He is, first of all, a man of great power of thought, of great constructive imagination, as the psychologists would say. So let us believe, first, that a genius is a man who has, occasionally, greater thoughts than other men have. Is this a reason for excluding him from society? Certainly not; for by great thoughts we mean true thoughts, thoughts which will work, thoughts which bring in a new era of discovery of principles, or of their application. This is just what all development depends upon, this attainment of novelty, which is consistent with older knowledge and supplementary to it. But suppose a man have thoughts which are not true, which do not fit the topic of their application, which contradict established knowledges, or which result in bizarre and fanciful combinations of them; to that man we deny the name genius: he is a crank, an agitator, an anarchist, or what not. The test, then, which we bring to bear upon the intellectual variations which men show is that of truth, practical workability—in short, to sum it up, "fitness." Any thought, to live and germinate, must be a fit thought. And the community's sense of the fitness of the thought is their rule of judgment.

Now, the way the community got this sense—that is the great result we have reached above. Their sense of fitness is just what I called above their judgment. As far, at least, as it relates to matters of social import, it is of social origin. It reflects the outcome of all social heredity, tradition, education. The sense of social truth is their criterion of social thoughts, and unless the social reformer's thought be in some way fit to go into the setting thus made by earlier social development, he is not a genius but a crank.

I may best show the meaning of the claim that society makes upon the genius by asking in how far in actual life he manages to escape this account of himself to society. The facts are very plain, and this is the class of facts which writers like Mr. Spencer urge, as supplying an adequate rule for the application of the principles of their social philosophy. The simple fact is, say they, that without the consent of society the thoughts of your hero, whether he be genius or fool, are practically valueless. The full-

ness of time must come; and the genius before his time can not be, if judged by his works, a genius at all. His thought may be great, so great that, centuries after, society may attain to it as its richest outcome and its profoundest intuition, but before that time it is as bizarre as the madman's fancies and as useless. What would be thought, we might be asked, of a rat which developed upon its side the hand of a man, with all its exquisite mechanism of bone, muscle, tactile sensibility, and power of delicate manipulation, if the remainder of the creature were true to the pattern of a rat? Would not the rest of the rat tribe be justified in leaving this anomaly behind to starve in the hole where his singular appendage held him fast? Is such a rat any the less a monster because man finds use for his hands?

To a certain extent this argument is true and forcible. If social utility be our rule of definition, then certainly the premature genius is no genius. And this rule of definition may be put in another way which renders it still more plausible. The variations which occur in intellectual endowment in a community vary about a mean; there is theoretically an average man. And the differences among men which can be accounted for by any philosophy of life must be in some way referable to this mean. Variations which do not meet their counterpart at all in the social environment, but which strike all the social fellows with disapproval, finding no sympathy whatever, are thereby exposed to the charge of being "sports" of Nature and the fruit of chance. The lack of hearing which such a man gets sets him in a form of isolation which stamps him not only as the social crank but also as the cosmic tramp.

Put in its positive and usual form this view simply claims that man is always the outcome of the social movement. The reception he gets is the measure of the degree in which he adequately represents this movement. Certain variations are possible—men who are forward in the legitimate progress of society—and these men are the true and only geniuses. Other variations, which attempt to discount the future, are sports; for the only permanent discounting of the future is that which is projected from the elevation of the past.

The great defect of this view is found in its definitions. We exclaim at once: Who made the past the measure of the future? And who made social approval the measure of truth? What is there to eclipse the vision of the poet, the inventor, the seer, that he should not see over the heads of his generation, and raise his voice for that which to all men else lies behind the veil? The social philosophy of the school of Spencer can not answer these questions, I think; nor can it meet the appeal we all make to history when we cite the names of Aristotle, Pascal, and Newton,

or of any of the men who have single handed and alone set guide-posts to history, and given the world large portions of its heritage of truth. What can set limit to the possible variations of fruitful intellectual power? Rare such variations—that is their law: the greater the variation, the more rare! But so is genius: the greater, the more rare. And as to the rat with the human hand, he would not be left to starve and decay in his hole; he would be put in alcohol when he died, and kept in a museum! And the lesson which he would teach to the wise biologist would be that here, in this rat, Nature had shown her genius by discounting in advance the slow processes of evolution.

It is indeed the force of such considerations as these which has led to many justifications of the position that the genius is quite out of connection with the social movement of his time. Prof. William James, for instance, in a most vivid and interesting article in the Atlantic Monthly, October, 1888, brings out the implications of the doctrine of variations very clearly, and bases upon it the further position that the causes which enter into the production of variations in the heredity of the individual are altogether physiological, and so represent a complete "cycle," apart from the other "cycle" of causes found in the physical and social environment of the individual. So that the individual brings his variations to his society whether society will or not; and as to whether there be any harmony between him and his social fellows—that is a matter of outcome rather than of expectation or theory.

But this is not tenable, as we have reason to think, from the interaction which actually takes place between the two so-called "cycles" of causation. To be sure, the heredity of the individual is a physiological matter, in the sense that the son must inherit from his parents and their ancestors alone. But granted that two certain parents are his parents, we may ask how these two certain parents came to be his parents. How did his father come to marry his mother, and the reverse? This is distinctly a social question; and to its solution all the currents of social influence and suggestion contribute. Who is free from social considerations in selecting his wife? Does the coachman have an equal chance to get the heiress, or the blacksmith the clergyman's daughter? Do we find inroads made in Newport society by the ranchman and the dry-goods clerk? And are not the inroads which we do find, the inroads made by the dukes and the marquises, due to influences which are quite social and psychological? And, on the other hand, what leads the duke and the marquis to lay their titles at Newport doors, while the ranchman and the dry-goods clerk keep away, but the ability of both these types of suitors to estimate their chances just on social and psychological

grounds? Novelists have rung the changes on this intrusion of the social into the physiological cycle. What is Bourget's Cosmopolis but a picture of the influence of social race characteristics on natural heredity, with the reaction of natural heredity again upon new social conditions?

A speech of a character of Balzac's is to the point, as illustrating a certain appreciation of these social considerations which we all to a degree entertain. The Duchesse de Carigliano says to Madame de Sommervieux: "I know the world too well, my dear, to abandon myself to the discretion of a too superior man. You should know that one may allow them to court one, but marry them—that is a mistake! Never—no, no. It is like wanting to find pleasure in inspecting the machinery of the opera instead of sitting in a box to enjoy its brilliant illusions." To be sure, we do not generally deliberate in this wise when we fall in love: but that is not necessary, since our social *milieu* sets the style by the kind of intangible deliberation which I have called judgment and fitness. Suppose a large number of Northern advocates of social equality should migrate to the Southern States, and, true to their theory, intermarry with the blacks. Would it not then be true that a social consideration had run athwart the physiological "cycle," in the production of a legitimate mulatto society? A whole race might spring from a purely psychological or social initiation. "Sexual selection" is certainly a principle of broad biological application in human affairs.

I agree, however, with the hero-worshiper so far as to say that we can not set the limitations of the genius on the side of variations in intellectual endowment. So, if the general position be true that he is a variation of some kind, we must seek somewhere else for the direction of those peculiar traits whose excess would be his condemnation. This we can only find in connection with the other demand that we make of the ordinary man—i. e., the demand that he be a man of good judgment. And to this we may finally turn.

In approaching this topic it is well to bear in mind a further result which follows from the reciprocal character of social relationships. If the man in question have thoughts which are socially true, he will, *ipso facto, know that they are true.* He is a social outcome as well as are the fellows who sit in judgment on him. He must judge his own thoughts, too, as they do. So his own proper estimate of things and thoughts, his relative sense of fitness, gets application by a direct law of his own mental processes to himself and to his own creations. The limitations which, in the judgment of society, his variations must not overstep, are set by his own judgment also. So we reach the conclusion regarding the intellectual variations which the genius may have:

he and society must agree in regard to the fitness of them, although this agreement is not the emphatic thing. The essential thing in this matter of intellectual variation is that the thoughts thought must always be critically judged by the thinker himself. This may be illustrated in some detail.

Suppose we take the man of striking thoughts and with them no sense of fitness—none of the judgment about them which society has. He will go through a mighty host of discoveries every hour. The very eccentricity of his imaginations will only appeal to him for the greater admiration. He will bring his most chimerical schemes out and air them with the same assurance that the real inventor exhibits his; but such a man is not pronounced a genius. If his ravings about this and that are harmless, we smile and let him talk; but if his lack of judgment extend to things of grave import, or be accompanied by equal illusions respecting himself and society in other relations, then we classify his case and put him into the proper ward for the insane. Two of the commonest forms of such impairment of judgment are seen in the victims of persecution on the one hand, the *exaltés* on the other. The images which throng into the consciousness of the former of these are those which represent his own powerlessness before an ever-present enemy. Neither the assurances of friends nor the evidence of his own senses are sufficient to rectify the judgment he makes that these imaginings are real. He has no true sense of values, no way of selecting the fit combinations of his fancy from the unfit; and even though some transcendently true and original thoughts were to flit through his diseased imagination, they would go as they came, and the world would still wait for a genius to arise and rediscover them. The other class—the *exaltés*—are somewhat the reverse. The illusion of personal greatness is so strong that their thoughts are infallible and their persons divine.

Men of such perversions of judgment are common among us. We all know the man who seems to be full of rich and varied thoughts, who holds us sometimes by the extraordinary power of his conceptions or the beauty of his creations. And yet we find in it all some incongruity, some eminently unfit element, some grotesque application, some elevation or depression from the level of commonplace truth, some ugly strain in the æsthetic impression. The man himself does not know it, and that is the reason that he includes it. His sense of fitness is dwarfed or paralyzed. We in the community learn to regret that he is so "visionary," with all his talent, and so we accommodate ourselves to his unfruitfulness, and at the best only expect an occasional hour's entertainment under the spell of his thinking. This certainly is not the man to produce world movements.

Most of the men we call "cranks" are of this type. They are essentially lacking in judgment, and the popular estimate of them is exactly right.

It is evident, therefore, from this last explanation, that there is a second direction of variation among men—a variation in their sense of the truth and value of their own thoughts, and with them of the thoughts of others. This is the second limitation which the man of genius shares with men generally—the limitation in the amount of variation which he may show in his social judgments, especially as these variations affect the claim which he makes upon society for recognition. It is evident that this must be an interesting and important factor in our estimate of the claims of the hero to our worship, especially since it is the more obscure side of his temperament, and the side generally overlooked altogether. I shall therefore devote the rest of my space to the attempt to illustrate this matter of what I shall call the "social sanity" of the man of genius.

IV.

The first indication of the kind of social variation which oversteps even the degree of indulgence society is willing to accord to the great thinker, is to be found in the effect which education has upon character. The discipline of social development is, as we have seen, mainly conducive to the reduction of eccentricities, the leveling off of personal peculiarities. All who come into the social heritage learn the same great series of lessons derived from the past, and all get the sort of judgment required in social life from the common exercises of the home and school in the formative years of their education. So we should expect that the greater singularities of disposition which represent insuperable difficulty in the process of social assimilation would show themselves early. Here it is that the actual conflict comes—the struggle between impulse and social restraint. Many a genius owes the redemption of his intellectual gifts to legitimate social uses to the victory gained by a teacher and the discipline learned through obedience. And thus it is, also, that so many who give promise of great distinction in early life fail to achieve it. They run off after a phantom, and society pronounces them mad. In their case the personal factor has overcome the social factor; they have failed in the lessons they should have learned, their own self-criticism is undisciplined, and they miss the mark.

These two extremes of variation, however, do not exhaust the case. One of them tends in a measure to the blurring of the light of genius, and the other to the rejection of social restraint to a degree which makes the potential genius over into a crank. The average man is the mean. But the greatest reach of human at-

tainment, and with it the greatest influence ever attained by man, is yet more than any one of these. It is not enough, the hero-worshiper may still say, that the genius should have sane and healthy judgment, as society reckons sanity. The fact still remains that even in his social judgments he may instruct society. He may stand alone and, by sheer might, lift his fellow-men up to his point of vantage, to their eternal gain and to his eternal praise. Even let it be that he must have self-criticism, the sense of fitness you speak of, that very sense may transcend the vulgar judgment of his fellows. His judgment may be saner than theirs; and as his intellectual creations are great and unique, so may his sense of their truth be full and unique. Wagner led the musical world by his single-voiced praise of the work of Wagner; and Darwin had to be true to his sense of truth, to the formulations of his thought, though no man accorded him the right to instruct his generation either in the one or in the other. To be sure, this divine assurance of the man of genius may be counterfeited; the vulgar dreamer often has it. But, nevertheless, when a genius has it, he is not a vulgar dreamer.

This is true, I think, and the explanation of it leads us to the last fruitful application of the doctrine of variations. Just as the intellectual endowment of men may vary within very wide limits, so may the social qualifications of men. There are men who find it their meat to do society service. There are men so naturally born to take the lead in social reform, in executive matters, in organization, in planning our social campaigns for us, that we turn to them as by instinct. They have a kind of insight to which we can only bow. They gain the confidence of men, win the support of women, and excite the acclamations of children. These people are the social geniuses. They seem to anticipate the discipline of social education. They do not need to learn the lessons of the social environment. Their "tact," we say, is great.

Now, such persons undoubtedly represent a variation toward suggestibility of the most delicate and singular kind. They surpass the teachers from whom they learn. It is hard to say that they are "learning to judge by the judgments of society." And yet they differ from the man whose eccentricities forbid him to learn through the discipline of society. The two are opposite extremes of variation; that is the only possible construction of them. It is the difference between the ice-boat which travels faster than the wind, and the skater who braves the wind and battles up-current in it. The latter is soon beaten by the opposition; the former outruns its ally. The crank, the eccentric, the enthusiast—all these run counter to sane social judgment; but the genius leads society to his own point of view, and interprets the social movement, of which he and his fellows are part, so ac-

curately, sympathetically, and with such profound insight that his very singularity is its inspiration.

Now, let a man combine with this insight—this extraordinary sanity of social judgment—the power of great inventive and constructive thought, and then, at last, we have our hero, and one that we well may worship. To great thought he adds balance; to originality, judgment. This is the man to start the world movements, if we want a single man to start them. For, as he thinks profoundly, so he discriminates his thoughts and assigns them values. His fellows judge with him or learn to judge after him, and lend to him the motive force of success—enthusiasm, reward. He may wait for recognition, he may suffer imprisonment, he may be muzzled for thinking his thoughts, he may die, and with him the truth to which he gave but silent birth. But the world comes, by its slower progress, to traverse the path in which he wished to lead it; and if so be that his thought was recorded, the world revives it in regretful sentences on his tomb.

The thing to be emphasized, therefore, on the rational side of the phenomenally great man—I mean on the side of our means of accounting for him in reasonable terms—is the sanity of his judgment; the fact that he has great thoughts being the acknowledged and familiar fact. And the variations from this social sanity give all the ground that various writers have for the one-sided views which are now current in popular literature. We are told, on one hand, that the genius is a "degenerate"; on the other hand, that he is to be classed with those of "insane" temper; and yet again, that his main characteristic is his readiness to outrage society. All these so-called theories rely upon facts—as far as they have any facts to rely upon—which we may readily estimate from our present point of view. As far as a really great man busies himself mainly with things which are objective, unsocial, and morally neutral—such as electricity, natural history, and mechanical theory with its applications—of course, the mental capacity which he possesses is the main thing, and his absorption in this may lead to a warped sense of the more ideal and refined relationships which are had in view by the writer in quest for degeneracy. It will still be admitted, however, by those who are conversant with the history of science, that the greatest scientific geniuses have been men of profound quietness of life and normal social development. It is to the literary and artistic genius that the seeker after abnormities has to turn; and in this field, again, the facts serve to show their own meaning. As a general rule, these artistic phenomena do not represent the union of variations which we find in the greatest genius. Such men are often distinctly lacking in power of sustained constructive thought. Their insight is largely what is called intuitive. They have flashes of

emotional experience which crystallize into single creations of art. They depend upon "inspiration"—a word which is responsible for half the overrating of such men, and for a good many of their illusions. Not that they do not perform great feats in the several spheres in which their several "inspirations" come; but with it all they do present the sort of unbalance and fragmentary intellectual endowment which allies them, in particular instances, to the classes of persons whom the theories I am discussing have in view. It is only to be expected that the kind of sharp jutting variation in the emotional and æsthetic realm which the great artist often shows should carry with it irregularities in heredity in other respects.

Besides, the very habit of this kind of genius, the habit of living by inspiration, puts a premium upon any half-hidden peculiarities which he may have, both in the remark of his associates and in the conduct of his own social duties. He gets to be considered the social exception, the anomaly, the man to be indulged; and his own sense of the greatness and peculiarity of his gifts leads him to claim the indulgence. I honestly think that a due imposition of certain social penalties upon men like Byron in the crises of their existence would at once have purified their lives and dignified their art; while at the same time it would have removed some of the best examples of Nordau and the rest, and suppressed the stimulus to the same kind of social deformity in later men of talent. Mark you, I do not discredit the superb art of these examples of the literary and artistic "degenerate"; that would be to make some of the highest ministrations of genius, to us men, random and illegitimate, and to deny to humanity some of its most exalting and intoxicating sources of inspiration. But I do still say that wherein such men move and instruct us they are in these spheres above all things sane with our own sanity, and wherein they are insane they do discredit to the inheritance to which their better gifts make legitimate claim.

One of Balzac's characters again hits the nail on the head. "My dear mother," says Augustine, in the Sign of the Cat and Racket, "you judge superior people too severely. If their ideas were the same as other folks they would not be men of genius."

"Very well," replies Madame Guillaume, "then let men of genius stop at home and not get married. What! A man of genius is to make his wife miserable? And because he is a genius it is all right! Genius! genius! It is not so very clever to say black one minute and white the next, as he does, to interrupt other people, to dance such rigs at home, never to let you know which foot you are to stand on, to compel his wife never to be amused unless my lord is in gay spirits, and to be dull when he is dull."

"But, mother, the very nature of such imaginations!"

"What are such 'imaginations'?" Madame Guillaume went on, interrupting her daughter again. "Fine ones are his, my word! What possesses a man, that all on a sudden, without consulting a doctor, he takes it into his head to eat nothing but vegetables? There, get along! if he were not so grossly immoral, he would be fit to shut up in a lunatic asylum."

"O mother, can you believe?"

"Yes, I do believe. I met him in the Champs-Elysées. He was on horseback. Well, at one minute he was galloping as hard as he could tear, and then pulled up to a walk. I said to myself at that moment, 'There is a man devoid of judgment!'"

The main consideration which this paper aims to present, that of the responsibility of all men, be they great or be they small, to the same standards of social judgment, and to the same philosophical treatment, is illustrated in the very man to whose genius we owe the principle upon which my remarks are based—Charles Darwin; and it is singularly appropriate that we should also find the history of this very principle, that of variations with the correlative principle of selection, furnishing a capital illustration of my inferences. Darwin was, with the single possible exception of Aristotle, the man with the sanest judgment that the human mind has ever brought to the investigation of Nature. He represented, in an exceedingly adequate way, the progress of scientific method up to his day. He was disciplined in all the natural science of his predecessors. His judgment was an epitome of the scientific insight of the ages which culminated then. The time was ripe for just such a great constructive thought as his—ripe, that is, as far as the accumulation of scientific data was concerned. His judgment differed then from the judgment of his scientific contemporaries mainly in that it was sounder and safer than theirs. And with it Darwin was a great constructive thinker. He had the intellectual strength which put the judgment of his time to the strain—everybody's but his own. This is seen in the fact that Darwin was not the first to speculate in the line of his great discovery, nor to reach formulas; but with the others guessing took the place of induction. The formula was an uncriticised thought. The unwillingness of society to embrace the hypothesis was justified by the same lack of evidence which prevented the thinkers themselves from giving it proof. And if no Darwin had appeared, the problem of biological development would have been left about where it had been left by the speculation of the Greek mind. Darwin reached his conclusion by what that other great scientific genius in England, Newton, described as the essential of discovery, "patient

thought"; and having reached it, he had no alternative but to judge it true and pronounce it to the world.

But the fate of the principle of variations with natural selection had the reception which shows that good judgment may rise higher than the level of its own social origin. Even yet the principle of Darwin is but a spreading ferment in many spheres of human thought in which it is destined to bring the same revolution that it has worked in the sciences of organic life. And it was not until other men, who had both authority with the public and information enough to follow Darwin's thought, seconded his judgment, that his great formula began to have currency in scientific circles.

Now I ask, Does not any theory of man which loses sight of the supreme sanity of Darwin, and with him of Aristotle, and Angelo, and Leonardo, and Newton, and Leibnitz, and Shakespeare, seem weak and paltry? Do not delicacy of sentiment, brilliancy of wit, fineness of rhythmical and æsthetic sense, the beautiful contributions of the talented special performer, sink into something like apologies—something even like profanation of that name to conjure by, the name of genius? And all the more if the profanation is made real by the moral irregularities or the social shortcomings which give some color of justification to the appellation "degenerate." But, on the other hand, why run to the other extreme and make this most supremely human of all men an anomaly, a prodigy, a bolt from the blue, an element of extreme disorder, born to further or to distract the progress of humanity by a chance which no man can estimate? The resources of psychological theory are adequate, as I have endeavored to show, to the construction of a doctrine of society which is based upon the individual, in all the possibilities of variation which his heredity may bring forth, and which yet does not hide or veil those heights of human greatness on which the halo of genius is wont to rest. Let us add knowledge to our surprise in the presence of such a man, and respect to our knowledge, and worship, if you please, to our respect, and with it all we then begin to see that because of him the world is the better place for us to live and work in.

We find that, after all, we may be social philosophers and hero-worshipers as well. And by being philosophers we have made our worship more an act of tribute to human nature. The heathen who bows in apprehension or awe before the image of an unknown god may be rendering all the worship he knows; but the soul that finds its divinity by knowledge and love has communion of another kind. So the worship which many render to the unexplained, the fantastic, the cataclysmal, this is the awe that is born of ignorance. Given a philosophy that brings the

great into touch with the commonplace, that delineates the forces which arise to their greatest grandeur only in a man here and there, that enables us to contrast the best in us with the poverty of him, and then we may do intelligent homage. To know that the greatest men of earth are men who think as I do, but deeper, and see the real as I do, but clearer, who work to the goal that I do, but faster, and serve humanity as I do, but better—that may be an incitement to my humility, but it is also an inspiration to my life.

THE SCALLOP (*Pecten irradians*).

By FRED MATHER.

WHETHER we follow the old spelling of "escalop," the modern form of "scallop," now used by naturalists, or write it "scollop," after the manner of the fishermen, we find all three modes sanctioned by the dictionaries. Near the seacoast this mollusk is a great favorite, rivaling the clam and the oyster, and by many persons preferred to either. The home demand is so great that the "scollop" is not sent far inland, and it is a matter of surprise how little is popularly known of the animal of which a portion is seen in our seaboard markets during the fall and winter months by those who sell and those who eat them.

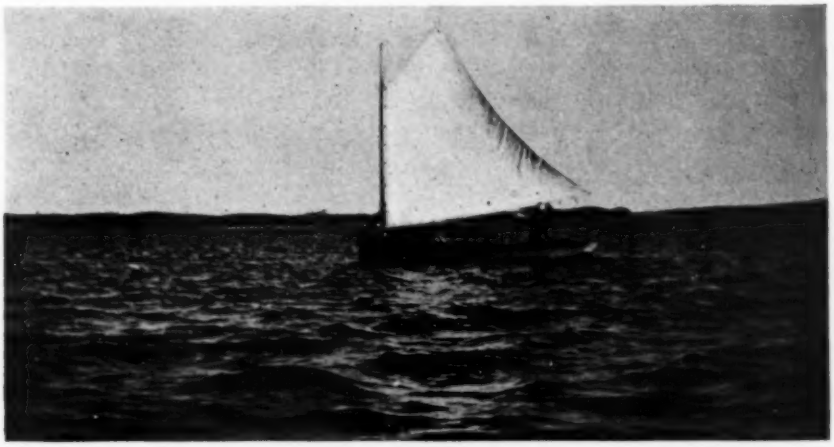
For many centuries the beautiful form of the scallop shell has been a favorite with artists, who have used it as an ornament in sculpture, pottery, and in designs of many kinds, and it is found on the armorial bearings of families whose ancestors had made a pilgrimage to the Holy Land or to Spain:

> For the scallop shows in a coat of arms
> That, of the bearer's line,
> Some one in former days hath been
> To Santiago's shrine.

The shell is not found on the Atlantic coast of Europe, but is common on the shores of Judea and other parts of the Mediterranean; hence its possession was evidence of the pilgrimage, and the Crusaders always wore the shell on their hats after returning. Fuller says: "The scallop shell (I mean the nethermost of them, because most concave and most capacious) was often the cup and dish to the pilgrims in Palestine; their arms they always charged therewith." The delicate shell has commended itself to makers of toilet and other articles for ladies' use, such as pincushions, made either in one valve or between both shells; needlebooks and many other things are made from them, but they are too frail for some uses that shells have been put to, such as scrapers, scoops, and dishes, yet from their employment by cooks to serve a peculiar

patty of oysters in, they have given the name of "scolloped oysters" to the dish, whether served in the shells or otherwise.

The only portion of this handsome bivalve that is edible is the adductor muscle, which closes the shells and corresponds to the "hard part" in the oyster, often miscalled the "eye"; the rest of the animal, being very soft, is called the rim by the fishermen. The little village of New Suffolk, on Great Peconic Bay, which divides the eastern end of Long Island into two long peninsulas, lives mainly from the scallop fisheries, which begin in September and end about the first of May, and are only interfered with by the freezing of the bay or by floating ice, for the hardy fishermen seldom mind the weather unless a gale should interfere



GOING IT ALONE.

with the management of the boats, which are small sloops of five to fifteen tons burden and are managed by two men—one at the tiller and the other at the dredges. They use from one to six dredges, according to the size of the boat. The scallop fleet of New Suffolk comprises twenty-six boats, and some few others of a smaller class occasionally join in the work. About seventy men do the catching and carting, while twenty men, thirty women, and eighty children open and prepare the catch for market; and as the population of the place is only two hundred and seventy-five, it may be truly said that all—grocer, postmaster, and stage driver—live from the catching of scallops. Children stop on the way home from school and open a few quarts, and mothers often rock the cradle with one foot while standing on the other at work in the shops.

Greenport, Sag Harbor, and other places on Long Island do much in this line of work, and tons of scallops come to New York from Rhode Island and other waters east of New York; but the

little hamlet of New Suffolk was selected to get information and pictures from, because the place has very little else to live upon, and the very air is impregnated with scallops, as you will find if you get to leeward of the great heaps of shells in rear of the shops,

LIGHT WIND, ONLY FOUR DREDGES OUT.

and no stretch of imagination could suggest that the odors came from the spice islands or were wafted from "Araby the blest." Fortunately, the shops are situated where the smell does not offend the noses of the people in the town, and is gone by the time that the few summer visitors arrive. There is a good hotel here—the Grant House—kept by a man well known in Brooklyn as a caterer, and a few families come to this quiet spot for the summer, while sportsmen fond of duck-shooting gather there in the fall. The fame of the fried scallops at the Grant House extends farther than the flavor of the shells. I was fortunate in securing the services of Captain George W. King, who has dragged the scallop from its lair for the past twenty years, and most of my information comes from him that is not taken from my investigations for the United States Fish Commission in 1880. Opposite New Suffolk is Robbins Island, where the famous club of that name turns out thousands of quail and other game yearly, for their fall shooting.

The dredge is similar to that used for oysters, consisting of an iron frame about three feet long by half as high, to which the

bag is fastened; the latter, holding a bushel and a half, is made of chain where it drags the bottom, and of twine on the top portion. The dredges are used in from three to thirty feet of water from the windward side of the boat, with a length of line varying with the depth and also with the speed, the line being shortened when the wind is light, to prevent anchoring the boat, and if the wind is very light the number of the dredges must be lessened. After sailing a certain distance the dredges are brought in one by one and dumped on the culling board, where the contents are assorted; the small crabs are thrown overboard, the winkles and

BRINGING A DREDGE ON BOARD.

starfish thrown one side for fertilizers, and the scallops shoveled into the hold. Thirty bushels a day is a fair catch for a boat, while fifty bushels is considered to be a good day's work.

Two other species are found on our Atlantic coast, both rare south of Cape Cod, one of which is common on the coast of Maine, is extensively fished for, and is very large. The species now under

consideration is rare north of Cape Cod and extends as far south as the Gulf of Mexico. In summer it is found among the eel-grass, where it breeds, and in the autumn comes into the shallow waters to feed. It moves by swimming in a dancing manner by suddenly closing its shells and ejecting the water and then taking in more. This is a beautiful sight in an aquarium, where they dance about like castanets played by an invisible hand. They are often seen in great schools, moving along, and when the tide is with them they sometimes go half a mile before dropping to the bottom. The scallop can see quite well, being furnished with a row of thirty or more beautiful blue eyes in the outer edge of the mantle of each side, the eyes increasing in number with the growth of the animal. This mantle is the "rim" of the fisherman, and, with the gills and a very flabby stomach, is about all of the scallop, except the great adductor muscle before mentioned. This muscle leaves no mark in the shells, such as is seen in the shells of the oyster and quahaug or hard clam. The shells of the scallop are unequal, the lower one being more convex and lighter in color than the other, and in opening them the dark side is held uppermost by a right-handed man, because it brings the "meat," which is not in the center, in the proper place for speedy work; a left-handed person, of course, requires the deep white side up. The openers, or "shuckers" as they would be called in Baltimore and the South, stand in a row in front of the benches, and drop the shells through a hole into a barrel, toss the meats in a square box holding two quarts, and the rims into another place, and they become very expert at this in time. Men and women open from fifteen to eighteen gallons a day, and children often open three or four gallons after school. Formerly the price paid for this work was twenty-five cents per gallon for all, but of late years the price has dropped with the market price of the meats to sixteen cents for large and twenty-five for small ones. In November, 1894, the shippers only got sixty-five cents a gallon from the market men and many stopped fishing, and the season of 1895 was no better, the fishermen attributing the failure to dredging late in the spring when the seed of the year was marketed in order to get high prices. They open two quarts to the bushel of shells and vary in size from eighty to three hundred and twenty to the quart; a gallon will weigh about eight pounds. Fifteen years ago fifty thousand bushels of shells were sold to oyster planters for catching spat, at two and a half cents per bushel; now the shells sell at six cents per bushel, and in some shops the rims are left with the shells. The shell of the scallop is excellent for catching oyster spat, because it is so fragile that it goes to pieces before the oysters begin to crowd and deform each other, as is the case where many set on a hard shell like that of the oyster.

In New York markets Rhode Island scallops have a reputation for excellence that may or may not be deserved, for in that city "Oyster Bay asparagus" is a label put on almost all bunches of that vegetable as soon as the product of New Jersey arrives; all small hard clams are "Little Necks," although that part of Long Island does not market over fifty thousand bushels in a year, and the quality of tenderness and flavor varies as it does

THE CULLING BOARD.

with "Blue Point" oysters, a term now used for most small oysters, as "Saddle Rock" is for large ones, although no oysters have been taken from that rock in twenty years. So much for a reputation; but the expert housewife looks the different lots of scallops over, passes by the white ones, and buys those of a yellow tint. The fact is that the meat of the scallop is naturally a faint yellow, but soaking whitens and injures it. This soaking in fresh water is done to make them swell and measure more, and it increases their bulk by about a third until the frying-pan has

done its work, when they will be found to have shrunken to less than the original size; hence it is best to avoid the white meats if possible. It is probable that the price for the unwatered scallops would be better if all shippers would agree to stop the practice, and then all scallops would be "Rhode Islands," although market men say that some from that State are watered. The practice is a bad one, because it injures the sale of the meats, as may be seen by comparing the prices in the markets. The scallop is never shipped alive in the shell, because it breaks easily

LOADING A WAGON.

and does not live more than a day or two out of the water; besides, being so bulky, the freight would be higher.

Fried with bacon is the most popular way this mollusk is served, although it is occasionally broiled or stewed, and in New York restaurants the order, "Fry, half and half," is often given, which means oysters and scallops, or it is sometimes "A fry, half scallops," for "a fry" is supposed to mean oysters alone. It is only some forty years since the scallop has been known in the markets and became an object of pursuit by the fishermen. Dr. De Kay, although living at Oyster Bay, on Long Island, knew little of it as food, for in his Mollusca, Part V, Zoölogy of New York, 1843, he says: "It abounds on shallow sandy bottoms and is taken in great quantities for food, the broad and stout muscular portion being the only part of the animal used. This is boiled and put in vinegar, and considered by many as a great

delicacy." The "great quantities" in those days meant a few hundred bushels, eaten by the dwellers on Long Island bays, for at that time there was no market for them. The rich, sweet taste of the scallop is disagreeable to a few persons and has been known to produce nausea at times, but to many its tenderness and pronounced flavor are more agreeable than those of any other bivalve.

An old legend claims that the scallop shell rightfully belonged, as a badge, not to the Crusaders and pilgrims to the Holy Land, but only to such as had made the pilgrimage to the celebrated shrine of St. James at Campostella, in Spain, as may be learned from the following account of a miracle:

"The ship in which the body of St. James was conveyed to its last resting place happening to draw near the coast during the performance of certain nuptial festivities, the bridegroom's horse, becoming ungovernable, plunged into the sea and together with its rider sank; but, at the moment the ship was passing by, rose again, close alongside of it. There were several miracles in this case. The first was, that the sea bore upon its waves the horse and horseman as if it had been firm land, after not having drowned them when they were so long under water. The second was, that the wind, which was driving the ship at full speed into port, suddenly fell and left it motionless; while the third and most remarkable was that both the garments of the knight and the trappings of his horse came out of the sea covered with scallop shells, which were afterward enjoined to be worn in commemoration of the event." If such a miracle should happen at New Suffolk to-day the judgment of the inhabitants would be like that in the historical eel case—the scallops would be sent to the shops, and the horse and its rider would be "set again."

Like all marine shells, our scallop is not as clean on the outside when it comes from the water as it appears after preparation for ornamental use. Many forms of animal and vegetable life have attached to it and made their homes upon it, especially on the upper or flatter valve. Here we find the red boring sponge which eats pinholes in all shells, inhabited or not, cutting through to the lining of nacre and occasionally through that to the interior. This injury is promptly repaired from the inside, but small elevations remain to show where the breach was healed. Tube worms build their twisted houses in such masses as to impede the movements of the scallop, and they have been known to bind several individuals together in a mass by their calcareous tubes while the mollusks were lying quiescent, a fact which seems to show that at some seasons the scallop must remain in one place for some time, long enough for the tube worms (*Serpula contortuplicata*) to grow and build their dwellings as increase of size

demands. Probably fair-sized colonies on two contiguous shells may not require many days in the growing season to unite in those shelly knots that may be broken but can never be untied.

THE SHOPS AND SHELLS.

Oysters, "jingles," and "deckers" * set on the shell and grow and impede its progress until it wearies of life and dies.

While on the subject of the shells of this animal it may be worthy to note that in addition to their acrobatic efforts to regain the water when left on shore by the tide, some of the old writers credited them with the sailing powers of the nautilus or "Portuguese man-of-war," and have asserted that, "by flapping their valves with a very quick motion, they can rise from their beds in the deep and navigate the surface, having one shell raised and so disposed as to catch the breeze in its concavity, while the other serves as a boat." We know that they can move below the surface, but must draw the line there.

In the month of May, 1895, I found eggs of the scallop well developed in the ovaries of the animal and apparently ripe, as they were extruded with slight pressure, but found no ripe males at the time, and therefore failed to impregnate the eggs. They were transparent and measured eighty to the centimetre, or over

* Jingles and deckers are fishermen's names for *Anomia glabra* and *Crepidula fornicata*, which, like the oyster, attach to shells, stones, etc.

two hundred to the inch. The absorption of water during the time in which they could have been fertilized would have enlarged the eggs, but to what extent is unknown. On June 10th I found microscopic scallops attached to blades of grass and weeds by a byssus, apparently like that of the mussel; they measured about eighteen to the centimetre, something over forty-five to the inch. Lack of circulation killed them in three days, and another lot was collected on June 18th, which were apparently of the same size.* No more were found until August 18th, when the growth was noticeable, the shells measuring about two centimetres, or three quarters of an inch. These last were taken from the bottom, and had lost the threads which had attached them to the grass.

Scallops are generally believed to live but a few years, many of the fishermen limiting them to only two, but this is a difficult matter to determine. They spawn in May in the bays of Long Island, perhaps in June also; the young attach to the eel-grass, and in August will measure three quarters of an inch across the shell. The next year they are about the size of an American silver dollar, and are too small for the use of most persons and for market. They are thrown on the beach at Cold Spring Harbor and along the north shore of Long Island by the winter winds and freeze in great numbers, and a frozen scallop never recovers life, as some mollusks are said to do. In this harbor there is often a good set of scallops on the grass, but their weight usually breaks the grass, and they are drifted out into Long Island Sound to stock other grounds, and it is only once in several years that there is anything like a scallop crop in the harbor, and when the season is called good the local demand takes them all, and none reach the market. The fact that this harbor, and Oyster Bay also, are extensively planted with oysters, would prevent dredging for scallops to any great extent if they were plenty, and the few that are taken are caught by the oystermen in their rowboats. From our present

* After these investigations, and since this article was written, Dr. James L. Kellogg has published similar observations on the scallop in the Report of the U. S. Fish Commissioner for 1893.

observations it seems as if the scallop might be fit for market in the winter after it is two years old, but not before. How long it may live after that it is impossible to say, further than to judge by the age of oysters and other animals that may attach to the shell of the living scallop, and it is more than likely that their attachment may cause its early death. Blackfish (tautog) eat them, the sheepshead crunches them, and they are often taken from the stomach of the cod and other fishes. The starfish, that devourer of all the shell-bearing mollusks and great enemy of the oyster, destroys them from the time the shell begins to form until the limit of growth is attained, and never desists while life is left in this interesting and useful bivalve.

EPIDEMICS OF HYSTERIA.*

By Dr. WILLIAM HIRSCH.

IT is a pretty widespread opinion that nervous diseases, and especially hysteria, have alarmingly increased during the last decades, and that they are about to increase much more. In all civilized countries, we are told, and in every stratum of the population, a weakness of the nervous system manifests itself of which our forefathers had no knowledge. Neurasthenia and hysteria spread wider and wider, like a devastating epidemic, attacking not merely the lower classes but just the "upper ten thousand." It is educated society which is threatened with total overthrow by utter derangement of the nerves. "Whither is this to lead, and how is it to end?" lament some solicitous prophets who already see yawning before them the gulf by which the enervated human race is about to be swallowed up.

Let us weigh the reasons which occasion this apprehension. What real proof is there of this enormous increase of nervous diseases and of the continually progressive degeneration of civilized man? First of all, there are the statistics. "Numbers," we have been told, "can not lie." Perhaps not; but those who collect them may fasten upon them very seriously mistaken labels.

The assiduous statistician ascertains that the insane asylums contain more women than men. So far, so good. But if he tells us that more women are insane than men, he labels those numbers erroneously, for the inequality is really due to the fact that insane males die off, while insane females survive, relatively speaking. Suppose the statistics of different countries do show that the number of inmates of insane asylums is increasing out

* From Genius and Degeneration. In press of D. Appleton & Co.

of all proportion to the growth of the general population, would it not be superficial in the extreme to conclude, without further data, that insanity was on the increase? At present these statistics mean nothing more than that the number of patients in such institutions has considerably increased. But when we consider what great advances have been made in the diagnosis of mental diseases, and consider also that a great number of such cases, which were formerly treated unsuccessfully at home, are now treated in such institutions with good results, because there they are removed from the detrimental influences of familiar surroundings, while the proper means and methods for rational treatment are at hand, we shall find that the seemingly enormous increase of mental disturbances need not cause us uneasiness.

Other extensive statistical material for nervous diseases is afforded by the numerous dispensaries of the great cities; but no extended experience is required to teach that a large proportion of such cases would not appear if the patients had to pay fixed fees, and round ones, as they had to do in the good old times when physicians saw comparatively little of nervous diseases. Our grandmothers had their "headaches" and their "twitchings in the limbs" like the women of to-day; but they never dreamed of calling a doctor or going to the dispensary for such things, so that they were not "statistical material."

In the dispensaries for nervous diseases there are numerous chronical patients who, becoming discouraged in one place, think they would like to try another doctor; and some of them make a round of sojourns in different hospitals. Each of them is counted as many times over in the statistics as there are places where he is treated. This perceptibly increases the numbers.

These considerations give some idea, though but a slight one, of the extreme difficulty of making even rough approximate inferences from sanitary statistics. But certain observers tell us that exact enumeration is not required. Hysteria and degeneration of the race stare us, as they aver, daily in the face. In every department of human activity disorders of the nervous system are seen. The very style and methods of the art and literature of the day proclaim a general nervous prostration.

Max Nordau is the protagonist of this widespread opinion. In his eyes, mental degeneration has seized upon the majority of civilized men to such a degree that "the upper strata of urban population" form but a "suffering hospital." The art, the poetry, the fiction, the philosophy of the day present the most manifold embodiments of degeneration and of secular hysteria.

Nordau admits, of course, that degeneration and hysteria have always existed. "But," says he, "they were formerly sporadic and were of no importance for the whole life of society."

In declaring that in former times hysteria was but of sporadic occurrence and attained no importance for the life of society as a whole, Nordau falls into a grave error. Mental diseases, and especially hysteria, have, from the earliest times to the present, exercised a tremendous influence upon the current metaphysical conception of the universe and upon the whole mental development, and that precisely because they not only occurred sporadically, but, as we shall soon see, attacked the masses in the form of epidemics, and so became of the highest significance and importance for the life of society as a whole.

Religious enthusiasm and proneness to the mystic and the occult formed, even in the highest antiquity, an important factor of those degenerate and hysterical individuals who entertained the delusion that they were in communication with good or with bad spirits, and who by that channel influenced the masses not a little. A great number of the priestesses who delivered oracular responses to the Greeks "with strong quaking of their body" were psychopathic subjects undergoing the hysterical convulsions well known to us to-day. Hence epilepsy, which in those days was not discriminated from hysterical cramps, came to be called the *morbus sacer*, or sacred disease. Plutarch, in his description of the Pythian priestess, delineates the typical image of a hysterical subject who, in ecstatic convulsion, stammered unintelligible words, into which the priests injected some sense. But hysteria, with its inclination to religious enthusiasm, was not limited to separate persons. On the contrary, we meet with it among all peoples and in all periods of history; and among all peoples we meet with it in the form of epidemics of various kinds. But never did this disease find a better or more fertile soil in which to thrive than in the middle ages of northern Europe, marked as they were by ignorance and superstition; and, accordingly, we find that epidemics of hysteria then assumed dimensions surpassing those of any similar outbursts in other centuries. A great many fine books have been written about the individual and epidemic crazes of those ages. The French have made particularly careful researches into the matter.

Calmeil describes a great number of hysterical epidemics of different forms. One of the principal eruptions in Germany was demonomania, or *Teufelswahn*. "In the year 1549," says Calmeil, "a delusion called *Vaudoisie* prevailed in Artois, that the devils carried many secretly in the night to the assemblies, where compacts were made with Satan and where carnal intercourse took place. Without knowing how, the participants of the nocturnal meetings found themselves next morning back in their dwellings."

A manifestation equally widespread in Germany was anthro-

pophagy—that is, the delusion that the devil and his worshipers lived on human flesh. Men were believed to live in the neighborhood of Berne and of Lausanne who had given themselves to the devil, and who ate their own children. Hundreds of men were for this stretched on the rack or burned at the stake. Indeed, there were a number of insane persons who thought that they themselves were in league with the devil, and that they slew children.

The bull of Innocent VIII, which appeared in 1484, showed how deep-rooted the devil-delusion was in Germany. Everywhere people talked of how there was a great league with devils whose votaries committed deeds of shame in their assemblies; of how they were under obligation to destroy and consume newborn babes before they were baptized. In one year after the publication of the bull, forty-one women were executed in Burbia because in their nocturnal assemblies they always strangled, boiled, and ate a child. Toward the middle of the sixteenth century there broke out in many places in Germany, especially in convents, epidemic convulsions which exhibited the typical image of *la grande hystérie* and were connected with symptoms of religious delusions and of sexual excitement. Of one convent we read: "It was singular that as soon as one nun had her fit, the others, even in distant parts of the building, would immediately go off into fits as soon as they heard the noise of a person falling. The nuns had no power of will at all; they bit themselves, struck and bit their mates, knocked against one another, and endeavored vehemently to wound strangers. Upon any attempt to control the indecency of their conduct, their tumult and exaltation would become more angry. If they were left to themselves, they would soon come to biting and wounding without seeming to feel the least pain." Such subjects were considered to be bewitched or possessed of the devil. They were treated by exorcisms and conjurations which often increased their sufferings.

Not women alone were attacked by the disease; men were visited in the same way. Gilles de la Tourette gives an account of such an epidemic, according to a description by Hecker. We read: "In Aix-la-Chapelle, in 1574, troops of men and women from Germany were seen laboring under a common madness and displaying in the streets and churches this singular spectacle. With clasped hands, and carried away by an inward compulsion which they could not master, they danced for hours and kept up the spectacle without being abashed by those who were about, until they would fall exhausted to the ground. Then they would complain of their great agony, and would groan as though they were going to die, until people wrapped their abdomen with linen cloths, whereupon they would come to themselves and be free for

a time from their sufferings. The object of this was to dispel the wind which set in after the attack. People often resorted to the simpler method of planting blows of the fist or kicks upon their abdomens. During their dance the subjects had visions. They did not see or hear; but in their imagination they beheld spirits whose names they pronounced, or rather shrieked out, . . . fell snorting to the ground without consciousness, and foamed at the mouth. Then, all at once, they got up and began their dance with frightful wrenchings. In a few months this plague extended from Aix-la-Chapelle as far as the Netherlands." Like the men and women, children were likewise attacked.

A phenomenon often seen to-day in insane asylums is that patients think themselves to be beasts, such as dogs, cats, monkeys, wolves, etc., and behave accordingly. In the middle ages this gave rise to the superstition of the Werewolf. The word is formed from *wolf* and the obsolete word *wer*, in Gothic *vair*, in Latin *vir*, man. Such persons, who during epidemics were sometimes found in great numbers, ran about the woods on all fours, lived and behaved exactly like beasts, fell upon men who might pass by, attacked even riders and vehicles, and stole children and devoured their flesh. Such things were known to the ancients too.

The influence which hysterical subjects exercised upon the whole metaphysics, or view of the universe of those times, was tremendous. While superstition and fanaticism may truly be called the best fertilizers to yield a crop of hysteria—and they have vastly contributed to its extension and large growth—at the same time, hysteria, in its turn, with its astonishing symptoms, far beyond the classificatory powers of those ages, has had the effect of enormously feeding and propagating superstition. In short, the two phenomena, hysteria and superstition, played into one another's hands; each was alternately cause and effect; and between them they called forth that dismal period in which the human mind was loaded with fetters, and postponed for centuries its free possession of its heritage. The author who is capable of saying that before this our time "hysteria only occurred sporadically, and was of no importance for the life of society in general," is not acquainted with the history of insanity and the biography of the human race. In order to pass judgment upon the present times from a psychological point of view, the very first requisite is an acquaintance with times gone by, and a tracing out of the path which has brought our culture to its present height.

Before passing on to the study of the present, let us first ask why and how it was that diseases of the mind took on an epidemic character. Most of those authors who have made hysteria the

subject of deep investigations agree in this: that *suggestibility* (using this word approximately in its psychological sense) is a particular mark of the state of soul of the hysterical.

No doubt hysterical epidemics based upon religion continue even to this day. The last century was by no means poor in such phenomena.

The principal causes of the spread of epidemics of insanity and of the so-called secular hysteria are, then, *suggestibility*, emotionalism, the impulse to mimicry, and the tendency to mysticism.

Secular hysteria has by this time gradually assumed a different character. Belief in the devil and witches has faded quite away. Nowadays phenomena that seem unaccountable are produced in great variety by the hysteria which still subsists, and lead to crazy doctrines and errors, but they are new ones. Spiritualism, which flourished most in the middle part of the century, had such an origin. All those surprising phenomena that in earlier times had been referred to the agency of the devil and of witches were now treated as evidences of spiritual presence, telepathy, etc. Hysteria and religious superstition had formerly communicated each vitality to the other; now hysteria and pseudo-science intensified and propagated one another. The literature to which spiritualism has given rise is perfectly enormous, and forms a pendant to the old books on witchcraft. Scientific men of standing write in our times thick books to discuss the evidences of the most incredible theories about spirits, about veracious dreams, about prophecies, about telepathy, about clairvoyance, about premonitions, etc.

With our present knowledge of hysteria, its causes and symptoms, men of science and all who are enlightened by its teachings are under a positive obligation, which can not be shaken off and must not be shirked, to combat everything which tends to further superstition or to nourish the inclination of the people toward mysticism. Our duty it equally is to set our faces against those pernicious practices which are calculated to favor and augment that fatal symptom of hysteria, a heightened *suggestibility*.

IT is suggested in the *Revue Scientifique* that the distinctions made in the laws for the protection of birds between insectivorous and graminivorous birds, and birds of passage and those of the country, are somewhat illogical. All birds eat insects during a part of the year, and the little fruit and grain some of them take is a cheap equivalent for the good they do in the destruction of insects. It is often hard to decide whether a bird belongs to the region or not. All birds are more or less migratory, and their stay in any place is largely governed by conditions of food and weather. Naturalists are often surprised by finding species wintering in the north that they had supposed were far in the south.

SKETCH OF WILLIAM WILLIAMS MATHER.

AMERICA will never cease to benefit from the influence of its Puritan stock. Although the former preponderance in national affairs of New England as a section has disappeared with the widening of our territory, the vigor, the intellect, and the conscience of the settlers at Plymouth and at Boston have been diffused by their restless descendants through every State in the Union.

WILLIAM WILLIAMS MATHER came from one of the most celebrated of the Puritan families in America. He was descended from Rev. Richard Mather, who fled to Massachusetts in 1635 to escape persecution for nonconformity. Richard Mather brought four sons to America, from the second of whom, Timothy, was descended the subject of this article. Two other sons, Eleazer and Increase, were born to Richard in this country, and the latter of these was the President of Harvard College from 1688–1701. Cotton Mather, the eminent divine and author, whose misguided zeal was such a strong support to the "witchcraft delusion," was a son of Increase. The paternal grandfather of William, Eleazer Mather, and his grand-uncle, Elisha, were officers of the Connecticut troops in the Revolutionary War. The eldest son of this Eleazer, who bore the same name, was the father of William. He learned the hatter's trade in Norwich and set up a business for himself at Brooklyn, in Windham County, Conn., which he carried on successfully for a number of years. He then traveled for a time in Canada, and returning to Brooklyn married Miss Fanny Williams, whose father, Nathan Williams, was also a soldier of the Revolution. After his marriage he ceased to follow his trade, and kept a temperance hotel, also giving considerable attention to the improvement of worn-out lands. His son William Williams was born in Brooklyn on May 24, 1804.

The Hon. Ivers J. Austin, who wrote the memorial sketch of him for the New England Historic Genealogical Society,* was unable to find any information concerning William's childhood, and very little in regard to his early youth. While still in his teens William formed the purpose of becoming a physician, and went to Providence, R. I., to take up medical studies. There he became much interested in chemistry, and on the occasion of a visit home he brought with him an elaborate piece of chemical apparatus, the cost of which rather astonished and displeased his father. But he so amused and instructed his family by his chemical experiments and explanations that his father became entirely reconciled to this outlay. In 1822 the young man

* It is from this memorial that most of the facts in the present article are derived.

applied for a warrant as a cadet at West Point, which he obtained in the following year. Recommending him for this appointment, the chief judge of Windham County wrote: "He is about eighteen years of age, possessed of much more than common talents and literature. He understands the Latin language, and some of the higher branches of mathematical science, which he acquires with much facility."

He entered the academy in the summer of 1823, and, in common with eight or nine other members of his class, spent one year more than the usual period there, being graduated in 1828. Young Mather was proficient in chemical analysis, especially of ores and minerals, before going to West Point, and in 1826, when Webster's Chemistry was passing through the press, the proof-sheets of a part if not the whole of the work were sent to him by the author for suggestions and corrections. These were furnished by him and were adopted, but Mather's name was not mentioned in the preface of the book among those who had contributed to it, and he expressed to his classmate and memoirist, Austin, his disappointment at the omission. In the fall of that year he entered the second class, thus coming to the studies of chemistry and mineralogy in the curriculum of the academy, Webster's book being used. Cadet Mather at once took the head of the class in these subjects, and easily kept his place to the end of the course. When off duty he explored the hills of the vicinity to collect minerals for his private cabinet and that of the lyceum. The chemical laboratory of the institution was also a place of resort for his leisure hours. During the last year of the course he was an assistant in the laboratory. He seemed to have a special aptitude for science and took great delight in experimenting. Mr. Austin illustrates this tendency by the following account:

"The winter of 1826–'27 was very cold. The ice, floating down to the narrow gorge between the precipitous shores of West Point and the opposite bank, became wedged there and was exceedingly thick. It occurred to Mather that a favorable opportunity was thus offered to ascertain the temperature of the water at the bottom of the river while the surface was covered with ice. After several attempts he succeeded in making a self-registering thermometer, and an apparatus for bringing up a specimen of the water of the lowest depth. A hole was cut through the ice about the middle of the river, and the apparatus, attached to a strong cord, was let down into the water, but the current was so strong that it failed to reach the bottom. With a heavier weight it sank far enough, but the pressure forced the cork into the bottle. The next attempt was successful; water was drawn from below, and its temperature ascertained from the self-registering, compared with that indicated by a detached, thermometer. The result of this experiment,

in which the writer assisted him, is not remembered, but Mather declared that he was satisfied with it. Such was his occupation on one of the coldest days in winter, during the whole of the Saturday afternoon allowed to the corps for recreation."

On graduating he was assigned to the Seventh Infantry with the customary rank of second lieutenant. He remained at West Point as acting assistant instructor of artillery during the summer encampment of 1828, and was then ordered to the School of Practice at Jefferson Barracks, where he remained until April, 1829. From April to the end of June he was on frontier duty at Fort Jessup, La. He was then detailed to serve as acting assistant Professor of Chemistry, Mineralogy, and Geology in the Military Academy, which duty he performed until the summer of 1835. The assistant professors at the academy at that time were usually detailed from recent graduates, and their terms of service rarely exceeded two years. The fact that Lieutenant Mather was retained in that capacity for six years indicates that he was an unusually successful instructor. During the recess of his course of instruction in 1833 he acted as Professor of Geology, with the permission of the War Department, at Wesleyan University, Middletown, Conn., and the following year received the honorary degree of A. M. from this university. In the summer of 1834 he made a geological survey of Windham County, Conn.

Within the first year after his graduation Lieutenant Mather published in the American Journal of Science a paper entitled On the Nonconducting Power of Water with Regard to Heat. While serving as assistant professor at the academy he contributed other papers to the same journal, and wrote a small textbook, Elements of Geology, which was afterward enlarged and passed through several editions. He wrote also an account of the diluvium for the use of the cadets in their study of geology.

On being relieved from duty at the academy he was assigned to topographical service as an assistant to G. W. Featherstonhaugh in a geological examination of the country from Green Bay to Coteau des Prairies. This work occupied him during the latter half of 1835. He made a topographical map of the St. Peter's (Minnesota) River Valley and a report, which his later associate Whittlesey says he refused to present to the "pretentious English geologist in charge of the expedition," but transmitted direct to the United States Government. When this survey was completed he was promoted to a first lieutenancy and sent to join his regiment on frontier duty at Fort Gibson, in Idaho Territory. The following summer he marched into the Choctaw country in command of his company. Feeling that he could now safely adopt the pursuit of science as a profession, he resigned his commission in the army at the end of August, 1836.

When he had been one year at West Point as assistant professor, Lieutenant Mather married his cousin, Miss Emily Maria Baker. By this marriage he had three sons and three daughters.

After leaving the army Mr. Mather was for a short time Professor of Chemistry, Mineralogy, and Geology in the University of Louisiana, but before the close of 1836 Governor Marcy, of New York, appointed him, together with Ebenezer Emmons, T. A. Conrad, and Lardner Vanuxem, to make a geological survey of that State. Each of these principal geologists was assigned to one of four districts, into which the State was divided for the purpose. Mather had the first district, which comprised Washington, Saratoga, Schenectady, Schoharie, and Delaware Counties, and all that part of the State to the southeast of them. What this survey accomplished has been told by Dr. James Hall, in the Popular Science Monthly for April, 1883. The work of the survey lasted about seven years. During this time Prof. Mather made five periodical reports and a final report. This last forms a quarto volume of six hundred and fifty-three pages, with forty-six colored plates, being one of the set of volumes embodying the results of the survey and published by the State.

In 1837 a State Geological Survey of Ohio was projected and Prof. Mather was made chief geologist. This ill-fated project was killed after an existence of little more than two years by a spasm of economy which attacked the Ohio Legislature of 1839. Two annual reports had been presented, and were printed as State documents, and a report on the collections was made afterward, but there was no final report, and no provision was made for preserving papers, field-notes, and maps. A geological reconnaissance of Kentucky, authorized by the Legislature of that State, was made by Prof. Mather in 1838–'39, his report being issued as a State document. Both his appointment in Ohio and that in Kentucky had been accepted with the condition that they should not prevent the completion of his work in New York.

Colonel Charles Whittlesey has stated, in an article on the Personnel of the First Geological Survey of Ohio, that after the suspension of the Ohio survey, Mather bought a tract of several hundred acres, including the Pigeon Roost, north of the courthouse in Jackson County, and became a citizen of Ohio. He cleared a part of this land for a farm and built him a comfortable house on it. Afterward he and Prof. James Hall entered a large tract of Government land in the southern part of the same county, on which they erected an iron furnace.

When Mr. Mather settled in Jackson County, in 1841, it was impossible to obtain sperm oil there for domestic lighting. The only recourse of the family was to mold tallow candles, which was very unsatisfactory. In the following winter Mr. Mather

began experimenting on the preparation of oil from lard. He placed the lard in a canvas bag and suspended it in a warm room, thus obtaining by the slow process of dripping an oil that the family used in lamps. An account of these experiments was published, and is believed to have been the starting point of the production of lard oil, which has since become so extensive.

About the time the field work of the New York survey was finished, Prof. Mather became Professor of Natural Science in the Ohio University at Athens. He held this position from 1842 to 1845 and from 1847 to 1850, being vice-president and acting president in 1845. The period from 1845 to 1847 was occupied in examining mineral lands for mining companies, mainly about Lake Superior, but also in New Jersey, Virginia, and Massachusetts. During the first quarter of 1846 he was acting Professor of Chemistry and Geology in Marietta College, his other engagements making him unwilling to accept the professorship. In the winter of 1845 he began a series of experiments on the extraction of bromine from the bitter waters of the salt works near Athens, Ohio. At that time bromine, which can now be had for sixty cents a pound, was selling at sixteen dollars an ounce. The results of his investigations were published in the American Journal of Science. They showed that bromine could be obtained from these waters for much less than it was then costing, and resulted in the establishment of a plant at Pomeroy, Ohio, which produces the greater part of the world's present supply of this substance.

In similar public and private employments the rest of his life was passed. He was Agricultural Chemist for the State of Ohio, and Secretary of the State Board of Agriculture from 1850 to 1854. During part of this time he edited the Western Agriculturist, and during the last year was member for Ohio of the United States Board of Agriculture. He also continued to make examinations of mineral lands. His first wife having died, he married in 1851 Mrs. Mary (Harries) Curtis, who survived him. By this marriage he had one son. The person of Prof. Mather was large and robust, and he had a great capacity for physical and mental labor. He died February 26, 1859, in Columbus, Ohio, at the age of fifty-four. His death was sudden, and was ascribed to a complication of dropsy and paralysis.

In addition to his writings already mentioned, Prof. Mather contributed frequent papers to the American Journal of Science and other scientific periodicals, and he wrote many reports on the explorations made in the course of his professional work. He received the degree of LL. D. from Brown University in 1855, was a member of twenty-five scientific and literary organizations, a life-member of many religious associations, and for fifteen years a trustee of Granville College.

In his various expeditions he collected large numbers of minerals and geological specimens. His collection was much increased by exchanges with American and foreign geologists, and at his death contained about twenty-six thousand specimens. At present it is owned by his son Richard, of Ironton, Ohio.

Mr. Austin thus describes his character: "Equable in his disposition and gentle in his manners, considerate of others and just in his judgment of them, modest, but manly and self-reliant, thoroughly versed in the branches of science to which he devoted himself, he had neither dogmatism nor ostentation. As he observed in a letter to a personal friend, who differed from him in regard to a geological question, 'I am not wedded to any theory, but seek the truth—and when found adopt it.'" He was not inclined to court popularity, neither was his manner forbidding. Letters preserved by his family and friends give abundant evidence of his gentle disposition, firm principles, and high sense of honor.

The supremacy of his will-power over physical pain is illustrated in the following anecdote: "While making an examination of coal lands near Pomeroy, in Ohio, he was wounded in the second finger of his right hand. This wound induced a partial paralysis, and required an amputation of the finger. The cause of it was supposed to be a snake bite. As soon as he was convinced by the examination that amputation was inevitable, he directed the surgeon to procure a block, a chisel, and a mallet, and, placing his finger on the block, told him to sever the finger at one blow. This was attempted, but proved a sad failure. The chisel was too thin and highly tempered, and the edge crumbled. Nevertheless, he directed the surgeon to go on, and several blows were required before a complete severance could be made; although in this painful operation the bone was crushed instead of being cut, he bore it without flinching."

The substantial national reputation as a geologist won by William W. Mather was the result of the steady and conscientious application of a natural aptitude. "Not possessing the genius which dazzles," says his friend Austin, "he had the intellect which, continually improved by exercise, achieved valuable results by patient and conscientious industry. What duty demanded, that he performed regardless of consequences, either to himself or others. Not indifferent to fame, he never sought it by doubtful or devious courses. His object was not to enhance his reputation, but faithfully to do the work before him. Through the whole of his active and laborious life of thirty years in the cause of science, in all the various and important public positions which he occupied, no breath of censure assailed his integrity, which was a law of Nature with him, rather than a choice or a principle."

Editor's Table.

WOMEN AND POLITICS.

THE MONTHLY has lately given place to two articles on the subject of the demand which is now being made by some women on behalf of their sex to be allowed to participate in political life on a footing of perfect equality with men. One of our contributors has tried to show cause why the demand should not be granted, taking the ground that the change would be injurious to society as a whole and particularly injurious to the female sex. The other treats the arguments of the first with scorn, and, if we are not mistaken, betrays not a little of that "antagonism of the sexes" which nevertheless she declares to be "unnatural and vicious." The question is one which ought to be discussed with complete dispassionateness; and we think that on this score there was no fault to find with the earlier of the two contributions, that by Mr. George F. Talbot, in our May number.

Our second contributor, Miss Alice B. Tweedy, disclaims the idea that "woman suffrage is proposed as a panacea for social evils, or that it will usher in a millennial condition. Man," she adds, "would be disfranchised if such requirement was made of *his* vote." The retort is sharp, but is it logical? Miss Tweedy's main contention is that a suffrage restricted to men is fundamentally insufficient for the best social results; and yet she does not want that complete system of voting which she advocates judged by any higher standard than the present incomplete system. If, however, woman suffrage is not "proposed as a panacea for social evils," what is expected of it? Our contributor says that "stringent laws are needed to prevent various evils, and to make certain offenses punishable"; adding that "women are quick to recognize vicious tendencies that men with a greed for money-getting often overlook." "Men with a greed for money-getting" is a phrase which suggests reflections. What is the chief cause of the greed which men display for money? We do not think we are far wrong in saying that it is the social ambition of the women of their families. It is women far more than men who establish social ideals; and, so far as there is a scramble for money, it is their scramble, to say the least, quite as much as the men's.

This, however, is a side issue: the contention that concerns us is that laws are wanted to make certain offenses punishable that are not punishable now; and that women, being quicker than men to recognize vicious tendencies, would get such laws passed if they only had the suffrage. This is a case in which a few examples would be very serviceable. The proposed laws are either such as would recommend themselves to the approval and support of men, or they are such as would not so recommend themselves. If they are of the former kind, they can get passed now; if they are of the latter kind, it is presuming upon an easy compliance worthy of the immortal Captain Reece, R. N., to ask men to make a constitutional change for the express purpose of defeating their own views and principles. Our contributor acknowledges that in this country "most of the laws (that were unjust to women) have been repealed, that many others are a dead

letter, and that still others have been enacted that favor women." We must not, however, thank "man's own sense of equity and right" for these beneficial changes. Why? because they have all been subsequent to certain "writings and arguments" of "women agitators." So that man does not exhibit any "sense of equity and right" when he is influenced by the pleadings of "women agitators." Poor man! He is judged very severely these days. We should like to remark, however, that *post hoc propter hoc* is not a very sound form of argument. Grant that the "writings and arguments are a matter of record," it does not follow that these writings and arguments really determined the changes in legislation referred to. What we know is that the changes were made, and that they were made by men under no actual compulsion.

At the outset of her article Miss Tweedy states that, "if every man considered it a matter of conscience to give voice in his vote to the feminine element in his household, it would put another aspect upon the demand for woman suffrage." How is it now, we feel like inquiring, in this matter? We imagine that the great majority of men who put any conscience into their voting at all do consider, as far as it is possible to do so, the interests of the feminine element in their households. When a man votes, he votes for a certain individual who is seeking a certain office. The cases in which there can be any division of interest in the family as to which candidate should be supported must be exceptional. When, however, a man gives a vote for one side or the other, there is good reason to believe—corrupt motives apart—that he thinks, not solely of his own interest as a male individual, but of all the interests, domestic and social, which he represents. In that sense the average elector's vote is meant to be, and is, representative. Our contributor's idea is that "after a family conclave" the husband, father, or brother should "quietly pocket his own conflicting opinion and support the measures favored by the home majority." The plan is beautifully simple in appearance, but we fear would present difficulties in practice. The man who was earning a living for his family could scarcely be expected to pocket his opinion upon a question, such as protection or free trade, which he believed had an important bearing on his business prospects; but at the same time we are sure that most men would be very glad to have any assistance which the female members of their households could give them in arriving at right conclusions on questions of the day.

If women are to be called upon to vote, it should be for very broad and sufficient reasons. The mere fact that some are demanding it is not a sufficient reason, inasmuch as others, and probably the great majority, not only do not join in the demand but are prepared to oppose it. Let us endeavor to indicate briefly how the matter presents itself to our mind.

In the exercise of the suffrage the individual asserts himself, claiming his share of political power. The vote is given to him for the protection of his political rights against the encroachments of other men. On voting day society is momentarily resolved into its constituent units. As long as men alone do the voting, they are supposed to represent the non-voting sex. Every man has or has had a mother, most have one or more sisters, and a very large proportion have wives. Every man's vote, therefore, we do not hesitate to say, ought to express his consciousness of

and respect for the family tie. To summon women to the polls would signify an antagonism between their interests and those of men. It would signify that a man and the women of his household are separate social units in the same sense in which two men are, and that they require protection against one another—that each must be armed with the ballot lest the others encroach. This assumption, in our opinion, is not warranted. Making all deductions for unfortunate instances, the family is in general a unit, and the wife, daughter, or sister has no desire to antagonize the vote of the husband, father, or brother. How about those women, it will be asked, who have no husband, father, or brother to represent them in a satisfactory manner? Our answer is that their case does not appear to us to be one of hardship unless it can be shown that, *considering them as a class apart from those who have male relatives*, they are suffering through lack of political influence. Simply as women they receive whatever benefit accrues to the sex in general through such improvements in the law as are daily taking place, and through the sympathy with woman which characterizes the normal man. To a considerable extent also the same means of influence are open to them as are open to other women. They are not cut off from society: they can speak and write; and how potent "women agitators" can be in procuring changes of the law Miss Tweedy has told us. What is mainly needed, in our opinion, is the deepening of the sense of trusteeship in men, and that fortunately is a process which is realizing itself more and more before our eyes. Far better so than that all trusteeship should be snatched from man with the snappish declaration that henceforth his wife, daughter, and sister will take care of their own interests. A singular time indeed for such a change to be made, when things have so shaped themselves that so earnest a female suffragist as our contributor is hard put to it to say what the disadvantages are under which women labor through man's control of the suffrage, or what laws they want passed which if duly explained and urged they could not now get passed!

There are other views of the question which we have only space to glance at. We can not lose sight of the fact that all law means compulsion—physical compulsion in the last resort; and this to our mind points to the conclusion that the responsibility for making laws should rest with those who could if necessary fight for their enforcement. It has before been pointed out that the situation which would be created if a large majority of women, in combination with a minority of men, passed laws repugnant to a large and effective majority of men, would be a very critical one for social order. Yet if nothing of this kind is going to happen, it is difficult to see where the special influence of woman's vote will come in.

Another point deserving of consideration is that the male sex, when all is said and done, is the progressive sex. Mr. Havelock Ellis's interesting and certainly far from prejudiced book on Man and Woman makes this clear. Broadly speaking, woman shows the statical, man the dynamical, aspect of humanity, and, as the work of legislation is in its nature continuous and progressive, it seems natural that it should be intrusted to that sex which best represents the onward movement of the race. Here, however, we must adjourn the discussion, which is one difficult to confine within narrow limits. Much probably remains to

be said on both sides, and we have no doubt the soundest arguments will prevail in the end.

THE DEVIL IN THE PUBLIC SCHOOLS.

A FEW weeks ago a most extraordinary story appeared in the daily papers of this city—a story of a panic that had occurred in one of our public schools in consequence of a statement made by a little girl that she had seen the devil coming into the building. It was at the hour of the noon recess, and the boys and girls were in their respective playrooms. No sooner had the words been uttered than all the girls in the room were seized with abject terror and began to scream in a frenzied manner, begging and praying to be saved from the fiend. The boys, whose room adjoined that of the girls, heard the shrieks and became almost equally terror-stricken. When the teachers appeared on the scene they could not for some time learn what the cause of the excitement was, so hysterical had the whole mass of the children become. Shortly a crowd gathered round the building, largely composed of women who had children in the school, and who, when they heard that the devil had appeared on the premises, became perfectly frantic themselves. The police having been sent for took possession of the building, and with considerable difficulty peace was finally restored.

It would appear from this that the devil superstition is not quite so extinct in the community as most of us perhaps have been in the habit of believing. It seems the children had been frightening one another for some time previously with stories of the devil, ghosts, etc., so that there had been a certain preparation for the panic that finally broke out. This is a matter, we think, in which teachers might very properly interest themselves a little. It does no small child good to believe in a devil capable of donning the conventional horns and tail and starting out on errands of destruction; and it is not probable that any important theological doctrine could be upset if children were told that such a devil was really a negligible quantity. There ought to be some way of talking even to very young children which would tend to take their thoughts off ghostly mysteries of all kinds, and concentrate them on what is beautiful and interesting and healthful in the world around them. The true corrective to devil worship —and all fear of the devil is a kind of worship—is the study of Nature and of the powers inherent in Nature. It should not be difficult to make children feel that there is really no scope left for the devil in the world as we know it to-day. Of course, if their parents or Sunday-school teachers, on the other hand, tell them that the devil goes about like a roaring lion seeking whom he may devour, the more wholesome teaching which we are advocating may be so far antagonized. No effort should, however, be spared in the public schools to put all the thoughts of the children on a natural and rational basis, and thus as far as possible to secure for them immunity against hurtful and degrading superstitions. This incident should be taken to heart by teachers generally, as showing the importance of knowing what thoughts are really engaging the minds of their pupils. The devil has had his day—he had a good thousand years of human history pretty much to himself—and there is really no impropriety in trying to keep him out of the schools of modern New York.

Scientific Literature.

SPECIAL BOOKS.

In his recently published History of the Warfare of Science,* Dr. Andrew D. White has given the world a work of great practical value—a work to which we can confidently refer any one who desires to know not only what is thought to-day in the principal departments of scientific inquiry, but by what stages the crude and illogical fancies of an earlier period gave way to conclusions founded on observation and induction. The title of Dr. White's book, we have no doubt, will give offense in certain quarters, but it would be difficult to say how the actual content of the book could be otherwise expressed. It is a narrative of conflict in which we invariably find that conclusions derived from the study of facts have had to make their way against opinions resting on the supposed authoritative utterances of a sacred book. In whatever direction we turn we find that theology has been beforehand with science in telling men what to believe, even in matters that turn on the evidence of the senses, and that science has to climb over mountains of obstruction and wage many a desperate battle before it can secure the right to deliver its message to mankind. How can this conflict be described otherwise than as Dr. White has described it? It is not a conflict merely between true science and false science, between sound views and unsound views, but a conflict between the observation of Nature and of facts generally and an utterly unreasoning adherence to *things said*. It is a struggle of *data* against *dicta*, science taking its stand on the former and theology on the latter. It is true that theology has, in these later days, reconsidered its position, and consented to hand over to the jurisdiction of science vast regions of thought which it once assumed to rule with absolute authority; but none the less was it theology which fought science step by step in the past, and that not by argument in any true sense, but by the weapons of physical force, and often in a spirit of intolerable arrogance and cruelty.

Although the rôle in which theology is necessarily made to appear in the volumes before us is a decidedly unamiable one, it would be unjust to Dr. White not to recognize the kindly and charitable spirit in which his work is written. He deplores the crimes against intellectual liberty that were perpetrated by ecclesiastical powers, but he rarely excites our enmity against the individuals concerned. He shows that they acted according to their lights, that their judgments were overpowered by the authority which it was common in their day to ascribe to sacred texts, and that, in resisting the most convincing demonstrations of scientific truth, they honestly believed they were following a surer and higher guidance. To them science, or the observation of Nature, represented at best the unaided operations of the human intellect, whereas Holy Writ contained the direct and authentic teaching of the Divine Spirit. How, then, could they hesitate between the two? How could they fail to consider as guilty of dangerous impiety those who ventured to set up the former against the latter? As we read Dr.

* History of the Warfare of Science with Theology in Christendom. By Andrew D. White, LL. D., L. H. D. 2 vols., 8vo, New York: D. Appleton & Co. Price, $5.

White's interesting pages we are made to feel the strength of the theological case as it presented itself to the minds of churchmen and devout believers. The Scriptures were divinely inspired: that was the first postulate. The Scriptures stated so and so in express terms, and had been understood and accepted in their plain sense by the greatest doctors and saints of the past, men whose dicta had an authority only less than that of Scripture itself. That was the second half of the argument. Was the authority of Scripture to be impugned and discredited because a few men of no authority, as authority was reckoned in those days, professed to have made this or that discovery in one region or another of physical observation? To let Scripture go was to let everything go, to destroy the whole basis of church authority, the whole foundation of social and moral order; and how to twist Scripture into seeming agreement with the alleged discoveries they had not yet learned. How the intellectual life of Europe was crushed for centuries under the weight of scriptural authority, how the scientific impulse, though a thousand times slain, a thousand times revived, how little by little true views of Nature forced themselves upon a priest-led world, and how in the end Science too gathered to herself authority and made for herself the dominant position which she enjoys to-day—all this, most graphically and sympathetically related, is the burden of the two handsome volumes before us.

There is one point upon which Dr. White has especially labored to be fair. He has not laid, as some writers have been more than half disposed to do, the whole reproach of obstructing and persecuting science upon the Roman Catholic Church. He makes it plain that science, so to speak, *had* to be persecuted by any body of men who were in the toils of such a theology as that which the early Christian Church formed for itself and bequeathed to later ages; and he shows how the several Protestant churches just in so far as, and so long as, they held to that theology were no less hostile to rising science than the old Church had been. It would indeed almost seem as if, within the last generation, the Catholic Church had more frankly made its peace with the methods and conclusions of science than the several Protestant churches have done; certainly the most recent examples of opposition to science which are quoted in these volumes are drawn from the proceedings and utterances of Protestant authorities, not of Catholic ones.

It is only right, however, that we should give a more adequate indication than we have yet done of the scope of the present work. The first chapter, which is entitled From Creation to Evolution, deals with the history of opinion on the subject of the origin and development of the physical universe. The crude ideas of ancient times are well represented, the author tells us, by a design which appears in one of the stained-glass windows of the cathedral at Ulm in Würtemberg, where the Almighty appears as busily engaged in the creation of animals, and has just turned off his hands an elephant fully accoutered with armor, harness, and housings, ready for war. In like manner we may still see in the Egyptian temples at Philæ and Denderah representations of the Nile gods modeling lumps of clay into men. "So literal," says our author, "was the whole conception of the work of creation that in these days it can scarcely be imagined. The Almighty was represented in theological literature, in the pictured Bibles, and in works of art generally, as a sort of enlarged and venerable Nuremberg toymaker." The slightest statement of Scripture in

regard to the constitution of the natural world was a sufficient foundation for the most highly elaborated beliefs; and the "yarns," if we may so designate them, which were told about the dragon, the unicorn, the leviathan, and one or two other unique animals mentioned in the Bible showed plainly that the imagination of our ancestors was in a state of high activity, whatever may have been the case with their logical faculties. The gap between such a condition of mind and that which prevails among the educated classes of our own day is vast; but Dr. White enables us to see by what successive accretions of knowledge a pathway was made from one to the other. To-day the idea of development is supreme, and that of creation, which was the only one our ancestors could entertain, has become almost an intellectual impossibility. In other words, we do not know how to go about thinking of creation, while familiarity with the fact of development, as it takes place in many ways before our eyes, has caused us to regard it as the typical and characteristic process by which all the constructive work of Nature is wrought.

The second chapter deals with the progress of thought on the subject of geography, including the form and size of the earth and the once much-vexed question of the antipodes. The third chapter takes up the subject of astronomy and gives a deeply interesting account of the struggle for the establishment of the Copernican system. Dr. White makes it clear that the opposition to the true view of the universe was almost if not quite as keen on the part of Protestant as of Catholic churchmen. Luther is quoted as saying: "People gave ear to an upstart astrologer who strove to show that the earth revolves, not the heavens or the firmament, the sun and the moon. . . . This fool wishes to reverse the entire science of astronomy; but sacred Scripture tells us that Joshua commanded the sun to stand still, and not the earth." Melanchthon argued in the same strain, and Calvin asked who would dare "to place the authority of Copernicus above that of the Holy Spirit?" In many universities, we are told, as late as the end of the seventeenth century, "professors were forced to take an oath not to hold the Pythagorean—that is, the Copernican—idea as to the movement of the heavenly bodies." University authorities used to make it their boast in those days that such pernicious doctrines had no place in their system of teaching, just as university authorities in our own day—it is our author who draws the parallel—sometimes boast that they discourage the reading of Mill, Spencer, and Darwin.

Further chapters are entitled From Genesis to Geology, Antiquity of Man, Fall of Man and Anthropology, Magic to Chemistry, Miracles to Medicine, Babel to Philology, etc., and all are replete with important information interestingly presented. Considered alone as a popular presentation of modern views upon the great scientific questions of the day, the work deserves to be widely read; but its value is greatly increased by the light which it sheds upon the development of opinion and the clearness with which it establishes the contrast between the fruitful methods of science and the unfruitful ones of theology in the domain of nature. Finally, it is, as we have already hinted, written in a large, tolerant, and sympathetic spirit, suggesting a mind raised altogether above petty prejudices and narrow enmities. It is a pleasure to us to think that the greater part of the matter contained in the work was first given to the public in the pages of the Popular Science Monthly.

THE readers of this magazine have already had a chance to enjoy more than half of Prof. *James Sully's* volume of *Studies of Childhood** in the series of articles which the author has contributed to our pages within the past two years. The additional matter consists of an introduction, part of the chapter on the Young Draughtsman, about ninety pages of Extracts from a Father's Diary, and a chapter on George Sand's Childhood based on that talented woman's Story of my Life. Prof. Sully by no means regards these studies as a complete treatise on child-psychology. They "merely deal," he says, "with certain aspects of children's minds which happen to have come under my notice, and to have had a special interest for me."

The first topic discussed is imagination—the happy faculty that gives playmates to the child isolated from others by distance, dangers of the outdoor world, illness, or other circumstances, and that turns familiar surroundings into scenery and accessories appropriate for imitating any desired activity of adults. From an examination of the examples that he has collected Prof. Sully concludes that imaginativeness varies greatly in different children, and that "there must be a much wider and finer investigation of children's action and talk before we can feel quite sure that we have got at their mental whereabouts." He maintains further that imagination and practicalness are not mutually exclusive in the minds of children, and gives evidence to show that first one tendency, then the other, may be dominant for days, and also that the one may succeed the other with astonishing rapidity in the same child. Probably the most entertaining chapter is that on The Little Linguist, in which the various phases of the child's struggle with the mother tongue are described and copiously exemplified. It is peculiarly difficult for the adult to put himself in the child's place with respect to fear of darkness, unusual objects, etc., so that the data that Prof. Sully is able to furnish on this subject are especially welcome. The part of the volume that will probably most interest the non-scientific parent or teacher is the two chapters bearing on the question why children seem to be imbued with so much concentrated naughtiness. Prof. Sully shows that it is not necessary to assume innate viciousness to account for acts of the child that inflict pain on other persons and on animals, for persistent lying, or for disobedience. Further, he shows that the child has a natural tendency to orderly procedure which needs only to be encouraged by consistency on the part of the parent to make the departures from right conduct very few. Prof. Sully draws conclusions freely from his facts, but probably no one would affirm more readily than he that these conclusions should be held subject to modification in the light of further evidence. It might have been better if this caution had been explicitly stated, or if some of the conclusions had been less confidently expressed.

GENERAL NOTICES.

IT is doubtful if any more generally interesting subject will be found for the Library of Useful Stories than the one treated in the second volume that Mr. Chambers* has contributed. It is evident also that this author has the faculty of making a truly

* Studies of Childhood. By James Sully. Pp. 527, 8vo. New York: D. Appleton & Co. Price, $2.50.

* The Story of the Solar System. By George F. Chambers. Pp. 188, 16mo. London: George Newnes, Ltd. 1s. New York: D. Appleton & Co. 40 cents.

popular scientific book. His text is everywhere readable, and his pages never bristle with repellent figures. Mr. Chambers gives a chapter to each of the planets, and one each to the sun, moon, minor planets, and those impressive wanderers, the comets. His mode of treatment gives the reader a personal acquaintance, as it were, with each member of the system by making prominent those characteristics of each which are of chief interest. His chapter on the sun gives especial attention to sun-spots; that on the earth to refraction, twilight, and the twinkling of stars which are phenomena of its atmosphere; that on Mars to its canals that on Jupiter to its satellites; that on Saturn to its rings; that on Uranus, as also that on Neptune, to the story of its discovery. On account of the lively popular interest in comets the chapter on these bodies is made second only to that on the sun in fullness. There are twenty-eight illustrations.

We are disappointed in this book—and glad to be.* From its title we inferred that it was a tissue of dogmatic assertion and ecstatic speculation; but examination shows it to contain a clearly arranged and vigorously presented chain of evidence concerning the physical and mental development of man. This is followed by a firm statement of belief in the teachings of the Bible. It consists of a series of lectures delivered on the foundation given by S. F. B. Morse to Union Theological Seminary with one additional chapter. The students who heard the lectures received a valuable addition to their equipment for their life work, and if the persons who are attracted by its title will read the book they will derive probably unexpected benefit from it. After an examination of the manner in which the problem of man's past has been largely solved, Prof. Tyler starts with the amœba, and in three chapters traces the course of animal evolution up through the invertebrates and lower vertebrates to man. In the next chapter mental development is similarly traced. The general nature of the process by which man has been produced is then discussed. "The animal is at first guided," says Prof. Tyler, "by natural selection through the survival of the most suitable reflex actions, then by inherited tendencies, finally by his own conscious intelligence and will. The first motives are the appetites, but these are succeeded by ever higher motives as the perceptions become clearer and more subtile relations in environment are taken into account." Conformity to environment, as our author describes the process, enables an animal to survive his less fortunate fellows; but if the animal is to progress it must keep such conformity secondary to obedience of the laws of its own structure and being. Man as he is to-day is the outcome of such a line of conduct, and his future upward progress depends on his measuring himself by ever higher and higher standards. It may be questioned whether this adaptation of men and animals to their surroundings ever becomes so largely voluntary as Prof. Tyler seems to represent. In the course of this discussion the author passes out of the field of science into that of religion, and in a chapter specifically devoted to the teachings of the Bible he insists on the reality of revelation and the efficacy of prayer, and gives some practical advice to young preachers. A chapter not forming one of the lectures concludes the volume. This deals with some of the present aspects of evolution, including Nägeli's theory of inherent initial tendency and giving especial attention to Weismann's views.

The widespread use of electricity and the numerous casualties resulting from ignorant or careless wiring make Mr. Robb's book* on electrical wiring a very timely one. It has evidently been intended mainly for the use of architects and insurance companies, but the text is so simply and clearly written that the ordinary householder will have no trouble in following it. Insulation, which is one of the most important portions of electric installation, is first considered; then the proportioning of wires to current, and the various systems of distribution and methods of wiring. The

* The Whence and the Whither of Man. By John M. Tyler. Pp. 312, 12mo. New York: Charles Scribner's Sons. Price, $1.75.

* Electric Wiring, for the Use of Architects, Underwriters, and the Owners of Buildings. By Russell Robb. Pp. 183-800. New York: Macmillan & Co. $2.50.

remainder of the book is taken up by a consideration of the national code of rules for electric wiring. This code, which has gradually been molded into its present shape by the underwriters, is now generally accepted by the best electrical companies. It is the result of a careful study of past accidents due to faulty wiring, and much experimental work with the various insulators and electric appliances. As the rules are necessarily short and contain many technical terms, Mr. Robb has, where necessary, defined the terms, and after each rule has stated the reasons for it. The book is well conceived, and should find a large field of usefulness especially among architects, who, as the author says, are not nearly so well up in electrical matters as they should be.

The essay for which a prize of five hundred dollars from the Henry M. Phillips fund was awarded by the American Philosophical Society in 1895 has been printed in the Proceedings of the Society. Its subject is *The Theory of the State*, and the writer is *George H. Smith*, of Los Angeles. Mr. Smith makes four chief divisions of his discussion, namely, (1) the nature of the state, (2) its functions, (3) its rights or rightful powers, and (4) the principles that should govern its political organization. In an introductory chapter he criticises the doctrine of absolute sovereignty as generally received in modern times, which he regards as standing in the way of an intelligent investigation of his subject. After discussing other definitions of the state he defines it as "an autonomous society of men," and proceeds to treat of the functions of such an organization. The rights or just powers of the state he treats as a subdivision of jurisprudence, using this word to mean the whole science of right. In his final chapter he deals with the principles of political organization, describing the several kinds of government, and discussing the principles that should govern the distribution of the sovereign powers.

The *Elementary Treatise on Electricity and Magnetism*, by *G. C. Foster* and *E. Atkinson* (Longmans, $2.25), affords a substantial college course in its subject. The work is a translation, considerably modified with the consent of the author, of Joubert's *Traité Élémentaire d'Électricité*. A notable departure from the original consists in the introduction of that view of the nature of electrical phenomena which was originated by Faraday and developed by Maxwell. This has involved keeping in view throughout the volume the dual character of electrification and emphasizing the essential part played in familiar electrical phenomena by the dielectric medium in which they occur. On the same account the idea of lines and tubes of force has been early introduced, and charge, capacity, and energy are spoken of as belonging to the electric field as a whole, rather than to the conductors which bound it. The work is almost exclusively devoted to the laws and principles of the science, giving but little attention to applications and none to history, and nearly all of its three hundred and eighty-one illustrations are cuts of laboratory apparatus or diagrams. The authors have made more use of mathematical reasoning than M. Joubert did, so that processes of calculation by the aid of formulas appear in every chapter.

It would seem possible to select a laboratory manual of chemistry suitable for almost any class from among those now published. One recently prepared by Prof. *Edward H. Keiser*, of Bryn Mawr (American Book Company, 50 cents), furnishes a list of two hundred and sixty-eight elementary experiments illustrating the properties of the common elements and the chief laws of chemical action. Certain of these experiments, designated Laboratory Demonstrations, are intended to be performed only by one or two of the more skillful students in the presence of the whole class. Questions are interspersed with the directions, some of which can be answered from the observations made on the experiments, and the rest from the text-book or lectures that will accompany the manual.

Mr. *Arthur H. Hiorns*, who is the author of several books on related subjects, has now written *Principles of Metallurgy*, a somewhat more advanced work than his Elementary Metallurgy, and containing new methods that have been introduced in recent years (Macmillan, $1.60). The arrangement of the matter is thus outlined in the preface: "The physical properties of the metals are considered first; then the chemical principles involved in the various processes are

explained; the information concerning the metallic alloys is placed together; this is succeeded by a description of fluxes, slags, and refractory materials; the nature and mode of preparation of different kinds of fuel are next referred to; then follows a more detailed description of the metallurgy of iron and steel, silver, gold, platinum, lead, copper, zinc, tin, nickel, cobalt, aluminium, antimony, arsenic, and bismuth." The properties of each metal are given and something is told of its uses. There are one hundred and forty-four illustrations, including cuts of furnaces and other apparatus, diagrams showing the course of operations, etc.

In a series of chapters which might well have been sermons, under the title *Old Faiths and New Facts*, an effort is made by *William W. Kinsley* to show that the beliefs in miracles, in the efficacy of prayer, in the divinity of Christ, and in a future life need not be disturbed by the discoveries of modern science (Appletons, $1.50). Two chapters of the book have appeared in the Bibliotheca Sacra, and those on prayer, at the instance of Bishop J. H. Vincent, were used as part of the prescribed Chautauqua reading for 1894. The volume will doubtless help many who have been dazzled by the new light of science to retain their religious beliefs.

An examination of various abuses in American public affairs comes to us in a volume by *Frederick W. Schultz*, entitled *Politics and Patriotism* (Arena Publishing Company). The author traces the growth of the American political ideal through colonial times, the Revolutionary period, and, after some discussion of the later amendments to the Constitution of the United States, carries his subject through the civil war and reconstruction periods. He next criticises the protection and greenback doctrines, and shows how selfishness is productive of many evils in the industrial relations. Inequalities of taxation are discussed at considerable length, and a series of striking examples possible under the laws of Maryland is given. In the concluding portion of the volume a brief history of exposures of corruption in New York, Baltimore, and other large cities is presented, and a scheme is offered for securing pure primary elections, which the author holds is the first step toward municipal reform. Mr. Schultz, who introduces himself as a man busy with mercantile affairs, writes with much feeling but temperately, and expresses himself clearly and concisely. His book is one to stimulate thought in the average citizen.

Evidently the true reason for the publication of the collection of *Fables and Essays* recently issued by *John Bryan* is that given in the preface, namely, "the same reason a hen lays eggs"—for relief to the author. Liberty and justice are the two avowed motives of the book. In the fables, brief essays, and bits of verse which it contains, satire and sentiment are mingled. The ideas that oftenest find expression in its pages are hatred of industrial and social oppression, and of priestcraft, honor and tenderness for the natural woman, impatience with the unnatural, sympathy with the victims of selfish greed, contempt for arrogance and pretense, and intolerance of artificiality in manners, education, and conduct. The personality of the author is everywhere apparent in the volume, and if the reader does not like that personality, Mr. Bryan makes it very evident that he need not read the book (The Arts and Lettres Company, New York).

A neat little handbook on *Physical Measurements*, by *L. W. Austin* and *C. B. Thwing*, has just come to hand. It is intended as a guide for the elementary student in the physical laboratory, and "simply presupposes such a knowledge of the principles of physics as can be gained from a course of general lectures supplemented by a good text-book." Each physical law, with the special pieces of apparatus for applying it to physical measurements, is taken up, and after a thorough description examples for testing the student's grasp of the principle are given. The last fifty pages of the book consist of the tables necessary for making computations and verifying the results (Allyn & Bacon, $1.50).

The portion of the college curriculum in which the most valuable and practical knowledge is obtained is the laboratory at any rate, in the physical sciences, and in some of the more abstract and difficult subjects, such as psychology, there is an increasing use of laboratory methods. In *Mechanics*, the last

of the Cambridge Natural Science Manuals to reach us, Prof. *R. T. Glazebrook* has embodied the results of his experience as a teacher both in the laboratory and its adjunct, the lecture room. The first portion of the book deals with dynamics, the second with statics, and the third and last with hydrostatics—two hundred and eight pages in all. Each physical law is illustrated by means of simple apparatus and experiments, and examples are scattered through the text for testing the student's grasp of each principle. The book is well printed and bound; illustrations are used where necessary; and although the work is by no means a complete treatise, it seems thoroughly good as far as it goes, and well suited to the needs of elementary students (Macmillan, $2.25).

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Fragments of Science.

Nutritive Value of Meats.—In a recent article on the value of meats as food, in the Dietetic and Hygienic Gazette, Prof. R. H. Chittenden corrects several very widespread misconceptions regarding meat values. He says: "The cheapest food is that which supplies the most nutriment for the least money. The well-known maxim that 'the best is the cheapest' is not true of foods, for the term best in this connection is ordinarily applied to that which has the finest appearance, the finest flavor, the most tender structure, etc. Thus, there is no more nutriment in a pound of proteid from tenderloin steak than in the same weight of proteid from the neck or shoulder, and yet note the great difference in cost. The tenderloin will not supply the body's needs one particle better than the coarse-grained meat from some other quarter. A great deal of money is spent by people who can ill afford it, because of this notion that the more expensive cuts are the more nutritious; much of it is perhaps attributable to lack of knowledge of the art of cookery. The housewife, not knowing how to properly prepare the cheaper grades of meat so as to make them palatable and attractive, concludes that they are not as nutritious as the more tender and juicy cuts that can be bought only at a higher price, and which require little judgment or skill to prepare for the table. Here is a field for missionary labor that will well repay the cultivation. Knowledge of this kind may be advantageously acquired by those whose means render it perhaps less vital; for a waste of food material is a crime against both pocket and morals." In speaking of the value of meat as a food in relation to the other food stuffs, Prof. Chittenden says: "Various extractives, active principles, etc., all endowed with more or less physiological properties, are likewise ingested as a part of the meat, and add their effects, perhaps to aid in keeping up the tone and vitality of the organism. Meats have certain stimulating properties, which distinguish them from the grosser vegetable foods. In this respect they might perhaps almost be classed with such articles as tea, coffee, etc., in their power of ministering to the wants of the brain and nerves. As Sir William Roberts well says: 'The struggle for existence, or rather for a higher and better existence, among civilized men is almost exclusively a brain struggle, and these brain foods must be regarded as a very important part of the

equipment for that struggle. If we compare as best we may with our limited information the general characteristics of the high-fed and low-fed classes and races, there is, I think, to be perceived a broad distinction between them. In regard to bodily strength and longevity the difference is inconsiderable, but in regard to mental qualities the distinction is marked. The high-fed classes and races display, on the whole, a richer vitality, more momentum and individuality of character, and a greater brain power than their low-fed brethren; and they constitute the soil or breeding ground out of which eminent men chiefly arise.' It is well understood that differences in mental capacity may be explained, in part at least, by differences in the type of nutrition of the brain cells, and nutrition is unquestionably modified and influenced by the quality of the food consumed. To again quote Sir William Roberts: 'Trainers will tell you that the hunter and the draught horse require to be fed differently. In the hunter is wanted rapid liberation of energy within a comparatively short space of time; in the draught horse is wanted a more gradual liberation of energy and for a longer period. The hunter is fed on a concentrated and stimulating food, the heaviest and most expensive oats, which, if I may so express it, is the beef of the vegetable feeders, while the draught horse is fed on a lower and less stimulating diet—on Indian corn and chopped hay, food which tends to increase bulk and weight.' So with mankind, the nature and quality of the nutrient—aside from its containing the due proportion of the several requisite elements—exert a specific influence upon the character of mind and body; and meats may be fairly placed in the front rank of foods as giving important aid toward that higher physical and mental development which belongs to the civilization of the nineteenth century."

Uranium.—Until the introduction of the electric furnace by M. H. Moissan, the oxides of many of the metals had been looked upon as irreducible by carbon. M. Moissan, three years ago, isolated the metal uranium in this way. The metal, when pure, is perfectly white, and is not magnetic. It has the remarkable property of emitting invisible phosphorescent rays capable of producing photographic effects through a medium opaque to ordinary light vibrations. The effects are precisely similar to those previously obtained from uranium salts, except that they are nearly four times as intense. The chemical behavior of uranium depends to a certain extent upon its state of division. The metal obtained by electrolysis, which is finely divided, takes fire in fluorine, is attacked by chlorine at 180°, by bromine at 210°, and by iodine at 260°, the reaction in all cases being complete. The powdered metal is completely burned in pure oxygen at 170°, and decomposes water slowly at the ordinary temperature, but more quickly at 100°. Uranium is one of the rapidly increasing group of metals which combine directly with nitrogen at high temperatures, and hence in its preparation it is necessary to work in such a manner as to completely exclude the air.

Working in Compressed Air.—E. W. Moir, in a paper read before a recent meeting of the Society of Arts, gave some interesting data regarding the effects upon the human system of working in compressed air and the various practical means of lessening the danger and overcoming any sudden collapses. Mr. Moir had charge of the work on the Hudson River Tunnel for a time, and has had some connection with most of the underground tunneling ventures of the past two decades. He says: "When I first came to New York the men had been dying at the rate of one man per month out of forty-five or fifty men employed, a death-rate of about twenty-five per cent per annum. With a view to improving this state of things, an air compartment like a boiler was made, in which the men could be treated homœopathically, or reimmersed in compressed air. It was erected near the top of the shaft, and when a man was overcome or paralyzed, as I have seen them often, completely unconscious and unable to use their limbs, they were carried into the compartment, and the air pressure raised to about one half or two thirds of that in which they had been working, with immediate improvement. The pressure was then lowered at the very slow rate of one pound per minute, or even less, the time allowed for equalization being from twenty-five to thirty minutes, and, even in severe cases, the men went away quite cured. No man ever suffers

by going into compressed air, unless his Eustachian tubes are blocked, in which case intense pain is produced, owing to the great difference in pressure between the two sides of the ear drum. The above-described lock should be used immediately on prostrations occurring, as it seems to be of little value after some time has elapsed. A very slight increase of carbonic oxide (if it much exceeds one part in a thousand) in the compressed air chamber leads to increased sickness. The impurity never affects a man while below, but only after he comes out, and we had mules working under pressure in New York for over twelve months at a stretch, which sold at good figures after coming out. Every man should be medically examined, and hot coffee should be given to each man before he comes out of compressed air. A warm room to dress in and extra clothing for passage through the lock should be supplied. At the Blackwall Tunnel, with the experience gained and attention to the above points, we have not had a single death, notwithstanding the fact that we had men working under a pressure of thirty-seven pounds per square inch for some time. Generally sparely built men, not too full-blooded, are those who stand air pressure best. A man with weak lungs may work and improve, but one with a weak heart or any apoplectic tendency should not go in at all. Drink of all classes is bad, but such drinks as tend to thicken the blood are worse than spirits."

The Electro-metallurgy of Aluminium.—Dr. Joseph W. Richards recently delivered before the Franklin Institute a very interesting and instructive lecture on the electro-metallurgy of aluminium. Several years ago the daily press gave considerable space to descriptions of the new aluminium industry and discussions of the modifications which its cheap production would bring about in the arts. While it subsequently proved unsuited to many purposes for which it was at first thought well fitted, it has become quite an important staple, and its applications are gradually increasing. Dr. Richards thus describes the process of manufacture: Pure alumina made from ore by a chemical process is stirred into a fused solvent bath composed of the double fluorides of aluminium and sodium. This bath may be simply cryolite, but preferably cryolite to which has been added a further proportion of aluminium fluoride and a little calcium fluoride (fluorspar). The alumina is dissolved by the bath to the extent of one fifth of its weight. The electric current is then sent through this mixture, using for anodes carbon rods dipping into the bath from above. The cathode is formed by the carbon lining of the vessel, on the bottom of which the melted aluminium collects. When the dissolved aluminium has nearly all been removed, the resistance of the bath rises, and fluorine fumes, from the decomposition of the solvent, begin to appear; fresh alumina is then stirred in and the operation thus proceeds continuously. The cavity containing the fused salt has a sump in which the molten aluminium collects and from which it is removed by ladles. The action of the current, when not of too high a voltage, is to decompose only the alumina as long as it is present in the bath in sufficient amount. The oxygen simply combines with the carbon anodes and passes away as carbonic oxide. The above process was discovered independently in 1886 by Heroult in Europe and Hall in America. In 1888 Hall put aluminium thus made on the market. The plants now engaged in making aluminium on this principle are as follows: The Pittsburg Reduction Company, at New Kensington, Pa., and at Niagara Falls, having a daily capacity of 4,400 pounds; the works at the Rhine Falls in Switzerland, capacity 5,000 pounds; and works at La Praz and Saint-Michel in France, with a combined capacity of 5,500 pounds. Besides these, there are in contemplation or course of erection five other plants, which will raise the total possible daily output to 42,900 pounds.

A Convention of Dragon Flies.—Some curious movements of dragon flies were observed one September afternoon by Prof. Charles Barrois, of Lille, along a road near Morbihan, France. The insects were seen, thousands in number, seated along the telegraph wire, all in the same position, their bodies in the axis of the wire, their heads turned west toward the setting sun, and their abdomens making an angle of twenty-five degrees with the wire. New insects were coming from every side, plunging first

toward one of those which were fixed, and hovering a few inches away from them, but only for a few minutes. The fixed insect turned its abdomen a few degrees, when the second immediately settled on the wire in the same attitude as the others, into an absolutely motionless position. The distance between the insects varied from about four to twelve inches, the average being about eight inches, while no two were closer together than four inches. They never came with full force upon the wire, but were seen pouncing from all points upon the settled individuals, when the proceedings described above followed; the insect always fixing itself so as to have a little clear space toward the west. Once settled, the dragon flies remained motionless, as if hypnotized by the reflection of the sun from the wire in front of them. Occasionally one would leave the wire, but always to settle itself at once a few yards farther on; none went away upon a long flight. M. Barrois found the wires thus occupied by dragon flies—he estimates that there were sixty thousand of them—for eight or nine miles, to where the line turned abruptly toward the south. The position of the insects, with their heads turned west, indicates that they were attracted by the sunlight; and the space which they all kept to the west of them was that required to afford a clear opening in which the reflection could take place.

Characteristics of Alpine Plants.—As described in Garden and Forest by M. H. Correvon, of the Alpine Garden, Geneva, the vegetation which thrives on great altitudes, like those of the Alps, Andes, Himalayas, and the mountains of Oceania, shows a distinct individual character readily noticeable. The plants are usually stunted, short-stemmed, or stemless, with flowers relatively exaggerated in size. The large flowers are almost sessile, with hardly apparent and only slightly developed foliage, which at a very high level is often clothed with a fine, close down, so as better to withstand the effects of cold nights. In many cases the foliage is glabrous, when it is also usually coriaceous (with tissues especially adapted to resist the frosts of Alpine climates); and the leaf, of a firm, close, thick texture, is provided with a solid epidermis and covered with a waxy coating, which enables it to withstand the effects of the sun as well as those of an excess of humidity. Species that grow in the shade and in well-protected spots are, however, not thus armed. Their foliage is soft and delicate, whereas woolly plants—take the Edelweiss and species having smooth, generally thick and glossy leaves—are usually encountered on arid, unsheltered slopes. Flora of altitudes exposed to the heat of the sun generally produces large, brilliantly colored flowers; while that of shaded situations exhibits very small, pale blossoms, entirely out of proportion to the size of the plant. The influence of the sun and its effect on vegetation are more striking here than elsewhere. Annual species, so abundant on lower levels, are rarely met with in Alpine zones. The short summer there does not permit them to accomplish the complete cycle of their existence in a single season. Alpine plants are always branched from the base with perennial rootstock and stems spreading on the ground, whereby the plant secures protection against inclement nights and severe days. All the activity and energy of the plant is brought to bear on the development of the flower and the reproductive organs. Owing to the conditions under which they thrive, Alpine plants require sometimes several years to accomplish the cycle of their existence, and need more than a single season to produce flowers and seeds. The flora of polar countries has a very different aspect from that of the mountains, though many species are common to both. The polar sunlight, though more constant, is less intense and more diffuse than that of the temperate regions in which most of the mountain flora has its home. The effects of the difference are seen in the plants and flowers.

Holy Wells.—Curious superstitions connected with holy wells are illustrated in M. and L. Quiller-Couch's book about those of Cornwall. Many if not all of these wells date as holy from pre-Christian times, and as it was not practicable or even possible to nullify the people's faith in them, the missionaries had to Christianize them by renaming them and dedicating them to some Christian saints, and there are now few English wells that have heathen names. Heathen rites

seem, however, to have lingered round the wells, for it was occasionally necessary in the middle ages to forbid devotions of certain kinds about them. Afterward the reverence for the wells and such practices as bathing crippled children in them and using the water to cure sore eyes, were regarded as papistical. They were supposed to cure illness and madness; if properly interrogated, to reveal the future; and, upon the simple condition of dropping a pin or a piece of money into the water, to secure good fortune to the worshiper. There are still, it is said, wells at the bottom of which pins may be seen. In Portugal, according to Mr. Oswald Crawfurd, the wells are supposed to be haunted by Moorish maidens.

Light-bearing Cephalopods.—An animal of the cuttlefish family, described by Henri Coupin and M. Joubin as *Histioteuthis Bonnetliana*, of bright rose color, has bright red membranes connecting the tentacles, and on the surface of its body yellow and blue spots of various sizes, with a bright point in the middle. These spots, according to Verany, shine while the animal is alive, but lose their glow after it is dead. They consist of a black cup, wide open at the top, with a large convex lens within the opening forming a kind of cover to it. Another round opening serves as a sort of frame to a second lens. A section lengthwise of the organ discloses a parabolic mirror and the two lenses arranged perpendicularly to each other, the whole forming a sort of black cylindrical lantern closed above by a large lens, which casts a light upward, and in front by another lens throwing it out horizontally. Another cephalopod, colored pale blue or violet, so like the sea as to be hardly visible, found in fine weather on the surface of the Mediterranean — the *Chiroteuthis*, a poor swimmer—is provided with special organs in the form of nets that are always spread to attract and capture its food of smaller animals. A series of intensely black vesicles may be perceived on its ventral arms, separated by little transparent suckers armed with a circle of sharp teeth. These vesicles are formed externally of concentric lamellæ and internally of a transparent vesicle, the contents of which have strong refracting powers. While the animal is living, light is decomposed by the concentric lamellæ, and the organs are thereby made iridescent with a silvery metallic luster. Smaller animals are attracted by the glitter of these organs, and are then seized by the suckers, which are kept on guard by the side of them. The suckers of the larger tentacles are incapable by their structure of seizing prey, but are helped, as in the case of these vesicles, by a combination of lure and snare, the lure consisting of highly colored vesicles or chromatosperes, and the snare of a network of waving, anastomosed lamellæ which issues from the cup and spreads itself around as a net. The animal swims slowly along, shaking its tentacles around itself, stretching them out and bending them back so as to keep out in the water around it innumerable lines to catch the little animals as they pass and hold them as if in the jaws of a pincers. A third type of hunting organs in this animal is that of special suckers at the ends of the tentacular arms, each containing a black organ forming a lure, with a well-developed sucker at the end.

A Theory of Sheet Lightning.—In his paper on thunderstorms in India, Prof. Michie Smith says that sheet lightning is seen at Madras every evening for six months, always near the horizon and directed toward the southwest. The time of occurrence varies from day to day, but is always toward evening, and generally not later than nine o'clock. The phenomenon is not a reflection of distant lightning flashes, but consists of an actual discharge of electricity from cloud to cloud or between two portions of the same cloud, and it takes place in the upper portions of low-lying clouds. When morning lightning occurs, its direction is northeast, hence the lightning is always to be looked for in the regions of still air where the land and sea breezes meet. The time of occurrence depends on the hour when the sea breeze sets in, the display being about three hours later than this. Cumulus clouds rise together in pairs and the discharge takes place between them, sometimes possibly within them. The author thinks the electrical conditions of the clouds may be accounted for by the fact that the sea breeze is moist and dusty, while the land breeze is dry and dusty. The presence of dust in the

clouds is shown when they sink rapidly; the dust is then seen at their edges and gives the iridescent or nacreous appearance frequently observed.

Horticulture an Object Lesson in Evolution.—The study of horticulture and agriculture is held up in Garden and Forest as having a distinct value as a factor in furnishing exercise for certain powers of the mind, and as providing in the systematic examination of the principles of those branches training than which no science affords better. Prof. Bailey, in Science, mentions some of the uses and applications of horticulture in discussing the theory of evolution. It shows the development of life in actual operation. More than six thousand species of plants are cultivated, and most of these have been broken up into varied forms by the hand of man. Some species have produced thousands of distinct forms, and the methods of production of many of them are on record. In place of arguments as to the probable influence of climate upon plants, the horticulturist cites definite cases, so that there is no conjecture about the matter. Instead of speculating upon the transmission of acquired characters, the horticulturist furnishes proof of such transmission. Paleontology brings disjointed evidence in regard to the influence of selection and probable changes from environment, while the horticulturist brings examples before our eyes to prove that he can modify and mold vegetation at his will. The horticulturist creates new species, and shows you numbers of cultivated plants of which no one knows the original form, because the ones with which we are acquainted are so unlike the type that the two can never be connected. This is only a single line of inquiry, and other illustrations quite as striking can be given to show that there is an abundant field for scientific research and profound thought in horticultural science as such.

Physical Characteristics of Cuba.—"In Cuba," says Mr. J. W. Spencer, in his paper on the Geographical Evolution of Cuba, "are mountains higher than any on the eastern side of North America; extensive plains as level as those of the Atlantic coast; valleys formed at the base-level of erosion, and deep cañons carved out by the youngest streams; the remains of enormous beds of limestones mostly swept off the country, and coral reefs and mangrove islands extending the coastal plains into the sea; sea cliffs, caves, and terraces of great and little elevation; drowned valleys deeper than the fiords of Norway indenting the margin of the insular mass; caverns innumerable and rivers flowing underground; rifts through mountain ridges and rock basins; tilted, bent, and overturned strata, dislocated and faulted in modern times, so as to make youthful mountain ranges; metamorphic rocks and rocks igneous, and these again altered to secondary products; old base-level plains or those modified and reaching across the island, having insular ridges of older formations rising out of them, and with the surfaces scarcely incised by the streams; residual soils from the decomposition of the rocks and sea-made loams and gravels; in short, so rapidly are the geologic forces working that one can see a greater variety of structure and learn more of dynamic geology in Cuba than on more than half of the temperate continent." The island is seven hundred and fifty miles long and from twenty-five to one hundred and twenty miles wide. In the western part the ridges of mountains culminate in a point with an altitude of twenty-five hundred feet, but the principal topographic relief is along the southern coast of the eastern extension of the island where Pico Tarquino rises from the Sierra Maestra to an elevation of eighty-four hundred feet. The central portion of the island is generally a plain of from two hundred to four hundred feet above tide, which bears many scattered and interrupted ridges like islands in a sea. Mr. Spencer's study is chiefly confined to this part of the island.

A Word in Favor of Woodpeckers.—The food of woodpeckers has been studied, with a view to determining whether they are injurious or beneficial in the economy of apiculture and forestry, by F. E. L. Beal, who concludes that they do far more good in the destruction of insects than harm with the little fruit and grain they eat and the sap they suck. Of seven species considered, the author regards the downy woodpecker as the most beneficial, it being a great eater of in-

jurious insects, while the vegetable food it consumes is of little value to man. The greatest sin we can lay at its door is the dissemination of poison ivy. The hairy woodpecker probably ranks next in point of usefulness. It eats many beetles and caterpillars, few ants, a trifling amount of grain, and for fruits it seeks the forests and swamps, where it finds wild cherries, grapes, and the berries of dogwood and Virginia creeper. It scatters fewer seeds of the poison ivy and poison sumac than the downy woodpecker. The flicker eats more of ants than of any other kind of insects, and very little corn, while fruit constitutes about one fourth its fare, "but the bird depends on Nature and not on man to furnish the supply." Not one of these three birds shows a questionable trait, and they should be protected and encouraged in every possible way. The redhead woodpecker has a pronounced taste for beetles of very large size. Unfortunately, however, its fondness for predaceous beetles must be reckoned against it. It leads in the consumption of grasshoppers, has a taste, but not a very damaging one, for grain, eats largely of wild fruit, and also partakes rather freely of cultivated varieties, especially of the apple; and in some places feeds extensively on beechnuts. The red-bellied woodpecker is more of a vegetarian than any of the others, but, on the other hand, eats many ants and beetles. The yellow-bellied woodpecker seems to show only one questionable trait, in a fondness for the sap and inner bark of trees. This, comparatively harmless in the forest, may be a serious matter in orchards. The pileated woodpecker is more exclusively a forest bird than any of the others, and its food consists of such elements as the woods afford, particularly the larvæ of wood-boring beetles and wild fruits. This species is emphatically a conservator of the forests.

MINOR PARAGRAPHS.

War is defined by M. Ch. Letourneau, in his book on the subject, as having robbery for its object and murder as its means. The author's other numerous books are about the evolution of some social factor or another, but he does not treat of the evolution of war—because, he avers, there is, fundamentally, no evolution of war. It is simply a return to the condition of savagery, an unchaining of all the bloodthirsty inclinations, an awakening of all ferocious appetites—such, he says, war has been in the past, and such it is destined to be in the future. The handling of the transportable material, the conditions accompanying preparation, strategic ingenuity, skill in the conduct of the campaign, diplomacy in fixing the lot of the vanquished—these accompaniments of war have been subjects of evolution; but all war is, and remains, in itself the apologetic manifestation of force—the most flagrant of all crimes—that of *lèse* humanity.

Wooden fishhooks are still in use in the waters of the regions around Bordeaux, France. Two kinds of different types are described. The *hain* is a small piece of broom-wood, spindle-shaped, sharp at both ends and swelled in the middle, about an inch long, and borne by a fishing line tied to the middle. The *clabéon* is a little shorter piece, of hawthorn, pointed at the lower end, with a thorn attached and projecting laterally from the upper end. The fishing line is double, and is fastened to the lower end of the stick and then looped around the base of the thorn. These hooks are in the forms of the most primitive times. Precisely similar ones to the *hain*, but of bone, have been found at the Robenhausen lake station of Wangen, and others of ivory at the cave of Pair-non-Pair, in the Gironde. The other one, the *clabéon*, is like the thorned fishhooks made by the Sakaya negritoes of the Malay Peninsula.

It is observed, in Knowledge, by Mr. Vaughan Cornish that while every one is familiar with the work of the breakers in tearing down cliffs and grinding the fragments into shingle and sand, it may easily escape notice that the formation of cliffs is also the work of the sea. The space through which the breakers act is chiefly that between high and low water mark, between which a sloping shore is cut away so as to form a nearly flat beach, terminated by a cliff. In point of fact, the destruction and

the formation of cliffs are the same process. Sometimes the waves pile up a bank of sand or shingle which protects the cliffs from the direct action of the breakers. The cliff, however, gives way under the actions of wind, rain, and frost; and the material carried down to the base of the cliff by these agencies is removed by the sea, so that the cliff is maintained at an angle steeper than the angle of repose, and is constantly falling. When the jointing lines of a rocky cliff slope downward from the shore line, the waves undermine the cliff, and great masses of superincumbent rock fall by their own weight, as the masses of coal fall in the mine through the skillful undercutting of the collier.

MR. A. H. THAYER has an article in a recent issue of The Auk entitled The Law which underlies Protective Coloration. In it he sets forth "a beautiful law of Nature which, so far as I can discover, has never been pointed out in print. It is the law of gradation in the coloring of animals, and is responsible for most of the phenomena of protective coloration except those properly called mimicry. Mimicry makes an animal appear to be some other thing, whereas this newly discovered law makes him cease to appear to exist at all. The newly discovered law may be stated thus: Animals are painted by Nature darkest on those parts which tend to be most lighted by the sky's light, and *vice versa*." The author's theory seems to be that Nature, by a careful coloration, effaces the ordinary lights and shadows by means of which a solid body is recognized, and that the various markings which at first sight seem unnecessary are really for the purpose of forming a background such as one might see if the animal were transparent.

A CURIOUS instance of protective mimicry combined with intelligence is found in the nest of the dabchick, which, as described by Mr. Harry F. Witherby, is simply a mass of green floating weed common in streams and ponds, like other masses of the same weed, except that it may be a little higher and more compact, but not sufficiently so to enable one to distinguish it. When the white eggs have been laid in it, means of concealment are called for, which the bird provides by covering up the eggs with leaves when it goes away, thus transforming the nest again into apparently nothing more than a floating mass of weed. In a few days the eggs become so covered with dirt that they are exactly of the color of the nest, and do not need even this protection any longer.

THE results reached in the report to the London Metropolitan Asylums Board on the use of antitoxine in diphtheria agree substantially with those recorded by observers in various other countries and confirm the favorable opinions. The general reduction in mortality obtained in the metropolitan fever hospitals is less than that claimed in some foreign institutions, but then, the London Times suggests, "there was less room for improvement in the former." In the more dangerous class of cases, and especially in those which came under treatment at an early stage of the disease, the drug fully maintained its reputation. These conclusions were unanimously concurred in by the six medical superintendents constituting the commission of inquiry.

THE Third International Congress of Psychology will be held at Munich, August 4 to 7, 1896. All psychologists and all educated persons desiring to further the progress of psychology and to foster personal relations among students of the subject in different nations are invited to take part in the meetings—in which women will enjoy equal consideration with men. German, French, English, and Italian will be the languages used. The programme of the work in the congress is arranged under the general headings of psychophysiology, psychology of the normal individual, psychopathology, and comparative psychology; while the subheadings suggest an extensive range and variety of topics. The subscription price for membership in the congress is fifteen shillings, twenty francs, or about four dollars. Persons intending to present papers—twenty minutes in length—should give due notice of the same, before the beginning of the congress, to the secretary, Dr. Freiherr von Schrenk-Notzing, Munich, Max Josephstrasse, 2.

THE growing of flowers to be put into the market as cut flowers has become an important business, and many large gardens are devoted to it in the vicinity of New York.

Growers, Garden and Forest says, who aim to get their flowers to market in the best condition, place the stems in water as soon as the flowers are cut. The flowers are kept in a cool, dark, underground room. The method of cooling by water is considered better than that by the use of ice, as the change of temperature on being taken to the express car is not so violent. The flowers are usually cut when the temperature of the houses is not extremely high, rather in the morning than in the evening. In summer as little time as possible is lost in getting the flowers to market, but in cooler weather some are improved if kept from twelve to twenty-four hours before being packed for shipment. In packing, long, shallow wooden boxes are smoothly lined with newspaper, above which sheets of thin oil paper are laid. The heads are usually placed at each end of the box. On arrival at New York they are taken to the rooms of the Cut Flower Company and there examined and graded according to established rules—roses, for instance, being classified as fancy, extra, first, second, and third.

NOTES.

SINCE the photographic method of observation was adopted, Prof. Max Wolf, of Heidelberg, has discovered thirty-six asteroids between the orbits of Mars and Jupiter, not one of which has he seen through the telescope.

THE total output of gold in the United States in 1895 was approximately $46,740,000. South Africa comes next, and Australasia third, with $45,835,000. Russia shows an increase in output over 1894 of $7,350,000, the 1895 production being $35,405,000. The estimated production in Mexico was $5,835,000.

IN recognition of his labors in connection with so eminent an American Institution devoted to the Encouragement of the Arts and Manufactures, and of services rendered to that Government, the French Government has named Dr. William H. Wahl, for many years Secretary of the Franklin Institute, "Officier d'Académie," and has conferred upon him the decoration of the "Palmes Académiques."

CLOSING a description of Lake Louise, in the Canadian Rocky Mountains, Mr. Walter D. Wilcox observes that the characteristic features of the region of Mount Temple (11,658 feet high) and of the Canadian Rockies in general, as differentiated from other mountain regions, as the Alps, Andes, and Himalayas, "are found not so much in the geological age and nature of the strata as in the extent and character of those erosive forces which have resulted in forming narrow, deep valleys, often with precipitous rock walls of great height and grandeur, thus making the mountains relatively very high. Added to this, climatic conditions sufficiently moderate in summer to tolerate, and humid enough to encourage, a rich vegetation, there results a fortunate combination of beauty and grandeur which has already begun to attract the attention of travelers. The by no means excessive precipitation of snow is offset by a long period of nearly ten months for accumulation, resulting in extensive glaciation on the higher peaks. As these points are favored by the addition of a clear, cool, and invigorating atmosphere, there is but little doubt that the Canadian Rockies will enjoy an ever-increasing popularity and favor among travelers and mountaineers."

IN the numerous scientific balloon ascensions he has executed, Dr. A. Bersen has met all the types of meteorological situations, and has found in all seasons that the temperature at great altitudes diminishes more rapidly than, or at least as rapidly as, at lesser altitudes, and that at heights exceeding seventeen thousand five hundred feet lower temperatures exist than those deduced from Glaisher's ascensions. So the increase in the velocity of currents with the elevation is also larger than has been supposed. A marked preponderance of winds with a westerly component is established for great altitudes—a fact that agrees with the results of cloud observations made from below.

THE movement for the introduction of horseless carriages is represented by two periodicals, the Horseless Age and the Motocycle, in the United States; the Autocar, in London; and La Locomotion Automobile and La France Automobile, in France. The Automobile Club of France, organized a few months ago, already counts nearly five hundred members, and has recently opened a hall in one of the most frequented quarters of Paris. It is arranging for races, competitions, exhibitions, conferences, and congresses, and will form a library for the use of its members. The French have bestowed a nickname on the automobilists, and call them *Chauffeurs*, or Warmers.

La Revista Literaria (the Literary Review) is a new bimonthly literary periodical of twenty pages, published at Buenos Ayres, under the editorial direction of Manuel B. Agaste. Office of publication, Peru, 69.

THE death of M. Daubrée, the eminent geologist, is announced. He was born in Metz, educated at the Polytechnic School of Paris, and from 1839 to 1855 was a professor at Strasburg University. He was then promoted to a chair at the School of Mines and the Natural History Museum, Paris.